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IFW AF/1754 #

Response Under 37 C.F.R. §1.192
Appellant's Brief

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PATENT APPLICATION
Serial No. 10/069,362
Attorney Docket No.: 128346.41501

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Group Art Unit 1754	:	
In re Application of	:	
Anthony, Thomas R., et al	:	**HIGH TEMPERATURE/HIGH TEMPERATURE PRODUCTION OF COLORED DIAMONDS**
Serial No. 10/069,362	:	
Filed June 5, 2002	:	
Examiner – Stuart Hendrickson	:	Pittsburgh, Pennsylvania May 10, 2004

APPEAL BRIEF

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal was commenced by a Notice of Appeal filed on March 8, 2004. This Appeal Brief is filed two months from the filing date of the Notice of Appeal on March 8, 2004. Since May 8, 2004 fell on Saturday, this Appeal Brief is timely filed on May 10, 2004. The Notice of Appeal appeals the final rejection of claims 1-22 and 28.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to mail stop Appeal Brief-Patents, Commissioner for Patents, Alexandria, VA 22313-1450

Lisa J. Pugliese
(Name of Person Mailing Document)

Lisa J. Pugliese 5/10/04
Signature Date

The headings used hereinafter and the subject matter set forth under each heading is in accordance with 37 C.F.R. §1.192(c).

I. REAL PARTY IN INTEREST

Thomas R. Anthony and Suresh S. Vagarali are the only inventors of the invention described and claimed in the above-identified application. These inventors have assigned all rights, title, and interest in the invention of the application to Diamond Innovations, Inc., of Worthington, Ohio, as evidenced by the attached assignments in Appendix II which were filed with the United States Patent and Trademark Office. The Assignment of Patents of General Electric Company to GE Superabrasives, Inc. and the Assignment of Patents of GE Superabrasives, Inc. to Diamond Innovation Inc. are included for reference purposes.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to the Appellants, the Appellants' legal representative or Assignee, which will directly affect or be directly affected by or have a bearing on the Board's decision in this pending Appeal.

III. STATUS OF CLAIMS

Claims 1-22 and 28 remain pending in the present application and are currently rejected. Claims 23-27 and 29-31 have been cancelled. Particularly, claims 3, 8, and 9 stand rejected under 35 U.S.C. §112, second paragraph. Claims 1-22 and 28 stand rejected under 35 U.S.C. §103(a) for unobviousness over U.S. Patent No. 4,124,690 to Strong, et al. alone or taken with U.S. Patent No. 3,609,818 to Wentorf, Jr.. Claims 1-16, 19-22 and 28 stand rejected under 35 U.S.C. §103(a) for obviousness over U.S. Patent No. 3,134,739 to Cannon.

IV. STATUS OF AMENDMENTS

The Amendment filed on March 8, 2004 in response to the Final Office Action of December 8, 2003, and simultaneously with the Notice of Appeal includes substantive amendments to the claims. The Examiner indicates in the Advisory Action dated April 15, 2004 that the proposed amendments will be entered upon the timely submission of a Notice of Appeal and Appeal Brief with requisite fees. The claims on Appeal are pending claims 1-22 and 28 listed in the Amendment of March 8, 2004, and included in the Appendix.

V. SUMMARY OF THE INVENTION

The present invention is directed to methods for producing colored diamonds, including neon yellow-green diamonds, from natural brown diamonds.

The claims on Appeal are directed to a method for changing the color of brown natural diamonds selected from one of a Type IaB, Type IaA/B, Type IaA or Type Ib diamond. The diamond has at least one of A centers, B centers, C centers, or combinations thereof. The brown natural diamond is placed in a pressure transmitting medium. The pressure transmitting medium is consolidated into a pill. The pill is exposed to an elevated pressure of at least 10 kilobars and an elevated temperature of at least 1500°C within the graphite stable or diamond stable range of the carbon phase diagram for a time sufficient to change the color of the diamond. The diamond having a color is recovered.

The claims on Appeal are also directed to a method having the following steps. A brown natural diamond is placed in a pressure transmitting medium. The pressure transmitting medium containing the natural diamond is subjected to a sufficiently high pressure and high temperature for a time sufficient to change the color of the diamond to a fancy color and recovering the diamond.

VI. ISSUES

The issues on Appeal include:

I. Are claims 3, 8 and 9 indefinite under 35 U.S.C. §112, second paragraph?

II. Are claims 1-22 and 28 obvious under 35 U.S.C. §103(a) over U.S. Patent No. 4,124,690 to Strong, et al. ("Strong") alone or taken with U.S. Patent No. 3,609,818 to Wentorf, Jr., et al. ("Wentorf")?

III. Are claims 1-16, 19-22 and 28 obvious under 35 U.S.C. §103(a) over U.S. Patent No. 3,134,739 to Cannon ("Cannon")?

VII. GROUPING OF CLAIMS

Claims 1-22 stand or fall together and are grouped accordingly.

Claim 28 stands or falls independently.

The support for consideration of the grouping of claims is addressed in the arguments set forth in the Arguments section of this Appeal Brief.

VIII. ARGUMENTS

The Arguments made in the Amendments dated October 9, 2003 and March 8, 2004 in response to the Office Actions are hereby incorporated by reference.

Each issue presented for review is addressed hereinafter under the appropriate heading:

I. CLAIMS 3, 8 AND 9 ARE NOT INDEFINITE UNDER 35 U.S.C. §112, SECOND PARAGRAPH.

Appellants respectfully submit that the term "discolored" in claims 3 and 8 have been amended to recite "brown" and therefore cannot be deemed indefinite.

Appellants also respectfully submit that the recitation of colors in the claimed invention is not subjective/unclear, and that the colors can be quantified/measured via spectro technology by one possessing the ordinary level of skill in the pertinent art of diamond/gemstone. It is well known in the diamond/gemstone art to qualify colors scientifically by using the CIELAB diagram. CIE is the Commission Internationale de l'Eclairage, the international body responsible for recommendations for colorimetry and photometry. The CIELAB (L*a*b) color space refers to the color diagram developed by CIE in 1976, and also is disclosed by Appellants in the Background of the Invention on page 7 of the application.

Attachment 1 is a paper titled "CIE Fundamentals for Color Measurements" by Yoshi Ohno of the National Institute of Standards and Technology, as presented at the IST&T NIP 16 Conference in October 2000, on the CIELAB diagram wherein the three attributes of color (i.e., hue, chroma, and lightness) are expressed in a three dimensional space or diagram. Appellants previously submitted this document to the Examiner on March 8, 2004. With respect to claims 8 and 9, Appellants respectfully direct the Board's attention to Figure 4 in the paper wherein the yellow green colors, or specifically the yellowish/greenish colors being defined to be the continuum of colors in the upper left (northwest) quadrant of the LAB color space diagram.

It should also be noted that in the CIELAB diagram, the hue angle h_{ab} is defined as $h_{ab} = \tan^{-1}(b^*/a^*)$ and the chroma is defined as $c = (a^{*2} + b^{*2})^{1/2}$.

Additionally a Google search using the key words "CIELAB color diagram 'yellowish green'" or "CIELAB color diagram 'greenish yellow'" yield a number of references discussing the CIELAB color diagram and the reproduction/identification of colors, including the colors in the claimed invention:

http://www.pcimag.com/CDA/ArticleInformation/features/BNP_Features_Item/0,1846,91729,00.html

http://cit.Dixie.edu/vt/reading/gamuts.asp

A copy of the screen print-outs of the above-referenced Web sites as provided to the Examiner on March 8, 2004, is also included in Attachment 1 herewith.

II. CLAIMS 1-22 AND 28 ARE NOT OBVIOUS UNDER 35 U.S.C. §103(a) OVER THE STRONG PATENT ALONE OR TAKEN WITH WENTORF.

Strong teaches the conversion of type Ib or mixed type Ib-Ia natural diamond having a "greenish-yellow" color or a "yellow" color as the starting color, to at least a shade of lighter yellow, i.e., for the result to be a diamond having a very pale yellow or a "colorless" crystal (Strong, column 6, lines 40-50). In the annealing method of Strong, type Ib nitrogen is partially converted to type Ia nitrogen and that the nitrogen is not "diffusing out of diamond or being converted to nitrogen or yet another type" (Strong, column 8, lines 63).

Wentorf discloses a high pressure, high temperature apparatus for the preparation of stronger, thicker diamond compacts, wherein a mass of diamond crystals is infused with a molten catalyst material.

The present claimed invention is directed to a method for changing a "brown" natural diamond selected from type IaB, type IaA/B, type IaA or type Ib with one of A centers, B centers, C centers, or combinations thereof, having the color changed. More specifically, the color change is achieved by forming a high concentration of H3 centers as determined by H3 absorption line at 503 nm and further explained in the specification of the application. The

method of the present invention includes placing the diamond in a pressure transmitting medium, consolidating the pressure transmitting medium into a pill, exposing the pill to an elevated pressure of at least 10 kilobars and an elevated temperature of at least 1500°C within the graphite stable or diamond stable range of the carbon phase diagram for a time sufficient to change the color of said diamond and recovering the diamond having a color. The method of the present invention also includes placing the brown natural diamond in a pressure transmitting medium, subjecting the medium to a sufficiently high pressure and high temperature for a time sufficient to change the color of the diamond to a fancy color and recovering the diamond.

Claims 1-22 and 28 are not obvious under 35 U.S.C. §103(a) over Strong, et al., alone or taken in consideration with Wentorf. In particular, the Examiner is incorrect in his understanding of the Strong reference in that Strong fails to teach or suggest, and moreover can not teach, a method for the changing of brown natural diamonds to diamonds having a color as recited in independent claim 1 or a fancy color diamond as recited in independent claim 28. In the method of the present invention, brown natural diamond of a Type IaB, Type IaA/B, Type IaA or Type Ib diamond, and having at least one of A centers, B centers, and C centers or combinations thereof becomes one of yellowish-green, greenish-yellow and neon yellow-green. Strong clearly does not teach or suggest the conversion of a brown natural diamond into one with yellowish-green, greenish-yellow or neon yellow-green color and rather solves another problem which is that for converting type Ib nitrogen to type Ia nitrogen diamonds resulting in a shade of lighter yellow diamond or even a "colorless" diamond. And therefore, Strong does not solve the problem of providing a color to a natural brown diamond as in the present claimed invention.

More particularly, Strong does not teach or suggest the mechanism by which the color of the brown natural diamond of the present claimed invention changes. It is known in art that Type I diamonds contain nitrogen which is present in different states. The Type I diamonds can be divided into the following: Type Ia diamonds where the nitrogen exists in an agglomerated state as either pairs called A centers (Type IaA) or clusters of four nitrogen atoms called B centers (Type IaB) or Type Ib where the nitrogen occurs as only single nitrogen atoms called C centers. Strong takes diamonds with single atoms of nitrogen, C centers, and converts the C centers to A and B centers by annealing. One skilled in the art reading Strong knows that the initial yellow diamond includes a high nitrogen content, and more particularly has only single

nitrogen atoms forming C centers, since it is known in the art that C centers produce yellow diamonds. By annealing diamonds in Strong, the concentration of C centers decreases and thereby produces A and B centers.

In the present claimed invention however, the initial starting diamond is brown natural in color. One skilled in the art knows that a brown diamond has A and B centers including combinations thereof. With the high temperature and high pressure method of the present claimed invention, vacancies in the lattice are created which combine with the A centers to form H3 centers. It is these H3 centers which impart the color obtained in the recovered diamond of the present invention, as described on page 11 of the specification.

Therefore Strong does not and can not teach or suggest the process of the present claimed invention because Strong teaches the conversion of C centers in yellow diamonds to A and B centers. In the present claimed invention, H3 centers are formed when vacancies generated during high temperature high pressure annealing combine with A centers. A centers could be already present in the natural "brown" colored diamonds (Type IaA or IaA/B diamonds) or they could be generated either by break up of B centers in Type IaB diamonds or formed by agglomeration of C centers in Type Ib diamonds. Therefore starting with a yellow diamond (C centers) as in Strong does not teach or suggest a method of the claimed invention for changing a brown natural diamond (A and B centers) to a color diamond (H3 centers).

Furthermore, Strong clearly teaches away from the present invention. The objective of Strong is to change the color of diamond crystals from Type Ib, i.e., "a deep golden yellow to a pale yellow with the deep golden yellow indicating substantially more type Ib dissolved nitrogen than the pale yellow" (Strong column 2, lines 53-55), to a Type Ia with *"the result [being] a very pale yellow and/or a colorless crystal"* (Strong column 6, lines 47-48). As the result of the Strong process, "at least a portion of the [Type Ib or mixed Type Ib-Ia] crystal undergoes some change in color or shade, ...*at least a shade lighter yellow*..." (emphasis added). Thus, Strong teaches away from the present claimed invention in the quest for a lighter and/or colorless diamond.

Moreover, Appellants respectfully contend that Wentorf does not cure Strong's deficiencies to teach or suggest the claimed invention of changing the color of a brown natural

diamond of a Type IaB, Type IaA/B, Type IaA or Type Ib with one of the A centers, B centers, C center, or combinations thereof. Additionally, one skilled in the art would not combine the teachings of the Strong reference with that of Wentorf. In particular, Wentorf fails to teach or suggest a method of converting Type Ib nitrogen to Type Ia nitrogen diamonds, or even any diamonds, and therefore one skilled in the art would not look to Wentorf to supplement the teachings of Strong to obtain the present claimed invention. For the foregoing reasons, independent claims 1 and 28 are not rendered obvious by Strong alone or in combination with Wentorf.

Claims 2-22 depend directly and indirectly from independent claim 1 and further define the method of the present invention. These claims further distinguish the claimed invention from the method of Strong and apparatus of inventors.

III. CLAIMS 1-16, 19-22 AND 28 ARE NOT OBVIOUS UNDER 35 U.S.C. 103(a) OVER THE CANNON PATENT.

Cannon discloses a method of whitening diamonds and changing the electrical characteristics of diamonds. Cannon relates to an electrically conductive diamond containing aluminum atoms introduced through a diffusion process. In particular, the method of Cannon as recited in col. 6 lines 66-70 is directed to the production of "colorless diamonds".

Appellants contend that the teachings of Cannon that the Examiner is relying upon, and Cannon itself, is inoperable. Attachment 2 is an affidavit executed by Dr. Suresh Vagarali. This affidavit was previously submitted to the Examiner on March 8, 2004. In the affidavit, Dr. Vagarali establishes that upon repeating the Examples in Cannon, the results as described in Cannon are not achieved. In other words, a diamond will not change color when practiced in accordance with the methods taught in Cannon. As stated in this declaration, Dr. Vagarali conducted four experiments to evaluate the effect of pressure and temperature for changing the color of diamonds as disclosed in Cannon. The experiments were run to determine the veracity of the Cannon invention as defined by the statement, "At high pressures and temperatures, diamonds grown become more clear and white, but aluminum diffusion provides a more marked and contrasting change to colors." (Cannon, col. 6 line 73 to col. 7, line 1). From the results of the experiments as shown in the affidavit, it is clear that the method disclosed in

Cannon is inoperable and therefore Cannon does not teach or suggest a method for changing the color of a diamond, let alone changing a brown natural diamond to a diamond having color as recited in Appellants' claimed invention.

Moreover, as evidenced by the publication "Simulation of Diamond Metallization using Aluminum" in Attachment 3, aluminum atom diffusion into diamond bulk as disclosed in Cannon is very difficult. The diamond has very high atomic density ($1.77x10^{23}$ atoms/cm^3 for diamond as compared to $5x10^{22}$ for silicon) and strong interatomic bonding. These impart diamond unique physical properties such as extreme hardness (9000 kg/mm^2 for diamond as compared to 4500 kg/mm^2 for cubic boron nitride) and high thermal conductivity (20 watts/cm.K for diamond as compared to 1 watt/cm.K for silver) and they also make diffusion of foreign atoms (such as aluminum atoms) into diamond extremely difficult. This publication further acts to evidence the inoperability of the teachings of Cannon. Therefore, Appellants contend that for the reasons of record and in view of Dr. Vagarali's declaration, Cannon can not teach or suggest the present claimed invention and therefore does not render independent claims 1 and 28 obvious.

Claims 2-16 and 19-22 depend directly and indirectly from independent claim 1 and further define the process of the present invention. These claims further distinguish the claimed invention from the process of Cannon.

CONCLUSION

In summary, the claims of the present invention define a process for changing the color a brown natural diamonds selected from one a Type IaB, Type IaAB, Type IaA or Type Ib diamond, having at least one of A centers, B centers and C centers or combinations thereof to a diamond having color. With regard to the rejected claims, the Examiner has not addressed all of the limitations of the independent claims nor the corresponding dependent claims. A prima facie obviousness of a claimed invention, requires that all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F2d 981, 180 USPQ 580 (CCPA 1970). The Examiner has failed to show in Strong, Wentorf and Cannon each and every element of the claims of the present invention. The preponderance of evidence clearly establishes the

allowability of claims 1-22 and 28. Reversal of all of the Examiner's rejections and allowance of claims 1-22 and 28 are respectfully requested.

A check in the amount of $330.00 accompanies this Appeal Brief. The Commissioner for Patents is hereby authorized to charge any additional fees which may be required to Deposit Account No. 50-0436. Please refund any overpayment to Deposit Account No. 50-0436. An original and two copies of this Appeal Brief are enclosed.

Respectfully submitted,
PEPPER HAMILTON LLP

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Date: May 10, 2004

APPENDIX I

1. (Currently amended) A method for changing the color of ~~discolored~~ brown natural diamond selected from one of a Type IaB, Type IaA/B , Type IaA or Type Ib diamond, said diamond having at least one of A Centers, B Centers, and C Centers, or combinations thereof, said method comprising:

(a) placing said ~~discolored~~ brown natural diamond in a pressure transmitting medium;

(b) consolidating said pressure transmitting medium into a pill;

(c) exposing said pill to an elevated pressure of at least 10 kilobars and an elevated temperature of at least 1500°C within the graphite stable or diamond stable range of the carbon phase diagram for a time sufficient to change the color of said diamond; and

(d) recovering said diamond, wherein the recovered diamond has a color.

2. (Currently amended) The method of claim 1, wherein said ~~discolored~~ brown natural diamond has a total nitrogen concentration less than 500 ppm.

3. (Currently amended) The method of claim 1, wherein said ~~discolored~~ brown natural diamond is a Type IaB, Type IaA/B , Type IaA or Type Ib diamond with platelets.

4. (Currently amended) The method of claim 1, wherein said ~~discolored~~ brown natural diamond is a Type IaB.

5. (Currently amended) The method of claim 1 wherein said ~~discolored~~ brown natural diamond is Type IaA/B.

6. (Currently amended) The method of claim 1 wherein said ~~discolored~~ brown natural diamond is Type IaA.

7. (Currently amended) The method of claim 1, wherein the ~~discolored~~ brown diamond is neon yellow-green color.

8. (Currently amended) The method of claim 1, wherein the ~~discolored~~ brown diamond has yellowish green color.

9. (Original) The method of claim 1 wherein the recovered diamond has greenish yellow color.

10. (Original) The method of claim 1, wherein said elevated temperature ranges from about 1500° to 3500° C and said elevated pressure ranges from about 10 to about 100 kilobars.

11. (Original) The method of claim 6, wherein said elevated pressure ranges from about 20 to about 80 kilobars.

12. (Original) The method of claim 1, wherein said recovered diamond is subjected to step (c) a plurality of times.

13. (Original) The method of claim 1, wherein said pressure transmitting medium is thermally and chemically stable at HP/HT and is selected from the group consisting of a salt, an oxide, or graphite.

14. (Original) The method of claim 2 wherein the final concentration of A Centers is less than 50 ppm.

15. (Original) The method of claim 1 wherein the total concentration of nitrogen is less than 50 ppm.

16. (Previously amended) The method of claim 2 where the final concentration of C Centers is less than 2 ppm.

17. (Original) The method of claim 9, wherein said pressure transmitting medium is a salt selected from the group consisting of sodium chloride, sodium iodide, sodium bromide, potassium chloride, potassium iodide, potassium bromide, calcium chloride, calcium iodide and calcium bromide.

18. (Original) The method of claim 9, wherein said pressure transmitting medium is selected from the group consisting of magnesium oxide, calcium oxide, and mixtures thereof.

19. (Original) The method of claim 9, wherein said pressure transmitting medium is graphite.

20. (Original) The method of claim 1, wherein said elevated temperature and elevated pressure are maintained from 30 seconds to 96 hours.

21. (Original) The method of claim 1, wherein said elevated temperature and elevated pressure are maintained from 5 minutes to 24 hours.

22. (Original) The method of claim 1, wherein said elevated temperature and elevated pressure are maintained from about 5 minutes to about 1 hour.

23. (Cancelled)

24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Cancelled)

28. (Currently amended) A method for changing the color of ~~discolored~~ brown natural diamond selected from one of a Type IaB, Type IaA/B, Type IaA or Type Ib diamond and said diamond having at least one of A Centers, B Centers, C Centers, or combinations thereof, said method comprising the steps of:

(a) placing said ~~discolored~~ brown natural diamond in a pressure transmitting medium;

(b) subjecting said pressure transmitting medium containing said natural diamond to a sufficiently high pressure and high temperature for a time sufficient to change the color of said diamond to a fancy color; and

(c) recovering said diamond.

29. (Cancelled)

30. (Cancelled)

31. (Cancelled)

APPENDIX II

CONFIRMATORY ASSIGNMENT OF PATENTS GENERAL ELECTRIC COMPANY TO GE SUPERABRASIVES, INC.

This Assignment, effective the 3rd day of June, 2002, is by and between GENERAL ELECTRIC COMPANY, a New York Corporation, having a corporate business address at One River Road, Schenectady, New York, 12345 ("Assignor"), and GE SUPERABRASIVES, INC., a Delaware Corporation, having its principal corporate business address at 187 Danbury Road, Second Floor, Wilton, Connecticut, 06897 ("Assignee") (and collectively, "the Parties" or "Party").

WHEREAS, Assignor and Assignee are parties to a certain Assignment, Transfer & Assumption Agreement dated June 3, 2002 (the "Assumption Agreement"), pursuant to which Assignee agreed to purchase certain assets of Assignor, and Assignor agreed to cause the same to be transferred, assigned and contributed to Assignee;

WHEREAS, Assignor is the record owner of all right, title and interest in and to the pending patent applications identified in Appendix A and issued patents identified in Appendix B attached hereto, including all inventions referenced therein and letters patent issued thereon and applications for letters patent applied for with respect thereto, throughout the world, and all reissues, divisions, continuations, continuations-in-part, renewals, extensions, subsitutions, and re-examinations of any of the foregoing throughout the world ("Patents");

WHEREAS, pursuant to the Assumption Agreement, Assignor desires to assign and transfer to Assignee all of its right, title and interest in and to the Patents, and Assignee desires to acquire the same;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

Without limiting the foregoing, the Assignor hereby sells, assigns and transfers to Assignee, its successors, assigns and legal representatives, all right, title and interest in and to the Patents, together with all rights to sue for past infringement of said Patents and all causes of action (either at law or equity) with respect thereto, the right of recovery, including but not limited to damages, for such past infringement, and the right to assign the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and for the use

and benefit of its successors, assigns and legal representatives. Assignor hereby authorizes the Assignee to record ownership of the Patents directly in Assignee's own name in any jurisdiction, municipality or agency, in which recordation is required.

IN WITNESS HEREOF, the parties hereto have duly executed this Agreement as of the Effective Date.

Signed at New York, NY on this 31st day of December, 2003.

GENERAL ELECTRIC COMPANY
Assignor

By: William A. Woodburn /poa WC

Name: William A. Woodburn

Title: Senior Vice President

AGREED AND ACCEPTED:

Signed at New York, NY on this 31st day of December 2003.

GE SUPERABRASIVES, INC..

By: _____

Name: William C. Carstanjen

Title: Vice President, Secretary

STATE OF New York)
)
COUNTY OF New York) ss:

BEFORE ME, the undersigned authority, on this day personally appeared William C. Carstanjen, having a Power of Attorney from William A. Woodburn, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledges to me that pursuant to said Power of Attorney he executed the same for the purposes and consideration therein expressed in the capacity therein stated and as an act and deed of said corporation.

Given under my hand and seal of Office this 31st day of December, 2003.

Notary Public Molly B Chase

My Commission Expires: 5/27/07

MOLLY B. CHASE
Notary Public, State of New York
No. 01CH6092796
Qualified in Queens County
Commission Expires 05/27/2007

STATE OF New York)
)
COUNTY OF New York) ss:

BEFORE ME, the undersigned authority, on this day personally appeared William C. Carstanjen, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledges to me that he executed same for the purposes and consideration therein expressed in the capacity therein stated and as an act and deed of such corporation.

Given under my hand and seal of Office this 31st day of December, 2003.

Notary Public Molly B. Chase

My Commission Expires: 5/27/07

MOLLY B. CHASE
Notary Public, State of New York
No. 01CH6092796
Qualified in Queens County
Commission Expires 05/27/2007

MOLLY B. CHASE
Notary Public, State of New York
No. 01CH6092796
Qualified in Queens County
Commission Expires 05/27/2007

APPENDIX A

APPENDIX B

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
112200 [Filed]	POLYCRYSTALLINE DIAMOND TIPS ON CUTTERS FOR HIGH SPEED DISC SAWHEADS FOR APPLICATION IN THE TIMBER INDUSTRY	United States	US	Provisional [Filed] S/N: 60/473511	23-May-03		
123571 [Filed]	AUTOCATALYTIC NICKEL-BORON COATING PROCESS FOR DIAMOND PARTICLES	United States	US	Provisional [Filed] S/N: 60/438957	9-Jan-03		
123989 [Filed]	LASER SUPPORT NICKEL-PLATING OF SUPERABRASIVE TOOL	United States	US	S/N: 10/172,034	14-Jun-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	Provisional [Filed] S/N: 60/395,182	10-Jul-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	S/N: 10/458903 **P/N: 6666753**	11-Jun-03		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	Provisional [Filed] S/N: 60/395,181	10-Jul-02		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	S/N: 10/455008	5-Jun-03		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	Provisional [Filed] S/N: 60/432222	10-Dec-02		
125185 [Filed]	**METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE**	**United States**	**US**	S/N 10/731,066	**9-Dec-03**		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	Provisional [Filed] S/N: 60/382209	21-May-02		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	S/N: 10/437469	8-Jul-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	125877 -7 Original [Filed]			
126337 [Filed]	SCRATCH-PROOF COMPOSITE WATCH GLASS	United States	US	Provisional [Filed] S/N: 60/399778	31-Jul-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	Provisional [Filed] S/N: 60/391707	26-Jun-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	S/N: 10/437516	14-May-03		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	Provisional [Filed] S/N: 60/414987	1-Oct-02		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	S/N 10/621,710	17-Jul-03		
129177 [Filed]	EXTRUSION AND COMPOUNDING EQUIPMENT COMPONENTS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445631	7-Feb-03		
129178 [Filed]	IMPROVED WEAR RESISTANT COMPONENTS FOR SIZE REDUCTION AND SIZE CLASSIFICATION EQUIPMENT	United States	US	Provisional [Filed] S/N: 60/445615	7-Feb-03		

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129182 [Filed]	WEAR CONTROL IN CONTINUOUS GLASS FIBER PLANTS	United States	US	Provisional [Filed] S/N: 60/445614	7-Feb-03		
129184 [Filed]	WEAR-RESISTANT DRILL BIT BODIES AND OTHER COMPONENTS FOR OIL AND GAS DRILLING	United States	US	Provisional [Filed] S/N: 60/445659	7-Feb-03		
129892 [Filed]	WEAR AND CORROSION RESISTANT ORIFICE AND RELATED COMPONENTS	United States	US	Provisional [Filed] S/N: 60/445633	7-Feb-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/440455	15-Jan-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/464517	22-Apr-03		
131068 [Filed]	WEAR AND CORROSION PREVENTION IN FIREARMS	United States	US	Provisional [Filed] S/N: 60/445609	7-Feb-03		
132255 [Filed]	AIRCRAFT ENGINE WEAR PARTS	United States	US	Provisional [Filed] S/N: 60/445632	7-Feb-03		
132270 [Filed]	CLIPPER BLADE SETS AND COMBS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445610	7-Feb-03		
132875 [Filed]	SELECTION OF DIAMONDS GRIT MORPHOLOGY AND SIZE DISTRIBUTION FOR CMP CONDITIONER APPLICATION	United States	US	Provisional [Filed] 60/509,625	8-Oct-03		
133139 [Filed]	IMPROVED WEAR PEROFRMANCE TOOLS FOR METAL, PLASTIC, CERAMIC AND COMPOSITE FORMING	United States	US	Provisional [Filed] S/N: 60/447808	14-Feb-03		
133140 [Filed]	PCD AND PCBN TOOL BLANKS WITH PREFIXED BRAZE ALLOY	United States	US	Provisional [Filed] S/N: 60/445613	7-Feb-03		
133141 [Filed]	COATINGS WITH HIGHLY TORTUOUS SURFACE TOPOGRAPHY FOR ABRASIVE/SUPERABRASIVE PARTICLES USED IN METALS/CERAMIC/POLYMER MATRIX COMPOSITES	United States	US	Provisional [Filed] S/N: 60/469285	8-May-03		
133615 [Filed]	IMPROVED TOOLS FOR MACHINING FIBER CEMENTS	United States	US	Provisional [Filed] 60/453,487	11-Mar-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	Provisional [Filed] S/N: 60/470306	14-May-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	S/N 10/690,761	22-Oct-03		
133920 [Filed]	DRILL BITS, ROUTER BITS, PROFILE CUTTERS, FILES, PLANING AND SAW BLADES WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/469287	9-May-03		
133975 [Filed]	METHOD TO IMPROVE TOOL INTEGRITY WHEN CUTTING STONE	United States	US	Provisional [Filed] S/N 60/495,148	14-Aug-03		
135143 [Filed]	A METHOD OF MAKING ABRASIVE TOOLS FROM BI-MODAL DIAMOND OR CUBIC BORON NITRIDE POWDER	United States	US	Provisional [Filed] S/N: 60/467311	2-May-03		

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136255 [Filed]	SINTERED COMPACT FOR USE IN MACHINING VARIOUS CAST IRON MATERIALS	United States	US	Provisional [Filed] S/N 60/526,576	3-Dec-03		
145361 [Filed]	COMPRESSION CONTAINER FOR POLYCRYSTALLINE WIRE DIE	United States	US	Provisional [Filed] S/N 60/528,372	10-Dec-03		
60SD10 [Filed]	DIAMOND AND CBN ABRASIVE COMPACTS USING SIZE SELECTIVE ABRASIVE PA RTICLE LAYERS	United States	US	S/N: 219289 P/N: 4311490	7-Sep-88		
60SD147 [Filed]	RE-SINTERED BORON-RICH POLYCRYSTALLINE CUBIC BORON NITRIDE AND MET HOD FOR MAKING SAME	United States	US	S/N: 823893 P/N: 4673414	29-Jan-86		
60SD184 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD240 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 542081 P/N: 4525179	14-Oct-83		
60SD242 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD245 [Filed]	MERGED WITH 60-SD-259 FOR FILING	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD24559 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD246 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD249 [Filed]	SWEEP THROUGH PROCESS FOR MAKING POLYCRYSTALLINE COMPACTS	United States	US	S/N: 536221 P/N: 4518659	23-Sep-83		
60SD251 [Filed]	IMPROVED PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 552081 P/N: 4525179	14-Oct-83		
60SD254 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 06/920041 P/N: 4738689	16-Oct-86		
60SD256 [Filed]	POLYCRYSTALLINE SANDWICH COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/277875 P/N: 5009673	30-Nov-88		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 697668 P/N: 4810447	4-Feb-85		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 8491 P/N: 4832708	27-Jan-87		
60SD261 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 7/366943 P/N: 5043120	16-Jun-89		
60SD262 [Filed]	BRAZED COMPOSITE COMPACT IMPLEMENTS	United States	US	S/N: 624064 P/N: 4527998	25-Jun-84		
60SD303 [Filed]	REFRACTORY METAL OXIDE COATED ABRASIVES AND GRINDING WHEELS MADE THEREFROM	United States	US	S/N: 07/358728 P/N: 4951427	30-May-89		
60SD305 [Filed]	STUD-MOUNTED POLYCRYSTALLINE TOOTHED DIAMOND CUTTING BLANKS	United States	US	S/N: 7/192872 P/N: D317010	11-May-88		
60SD308 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 7/365268 P/N: 4931363	12-Jun-89		

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60SD30811 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 158575 P/N: 4899922	22-Feb-88		
60SD317 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 920041 P/N: 47386689	16-Oct-86		
60SD318 [Filed]	BONDING OF THERMALLY STABLE ABRASIVE COMPACTS TO CARBIDE SUPPORTS	United States	US	S/N: 07/158336 P/N: 4850523	22-Feb-88		
60SD327 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 008491 P/N: 4832708	29-Jan-87		
60SD33 [Filed]	OPTICAL WINDOWS MADE OF POLYCRYSTALLINE ADAMANTANE BORON NITRIDE OR DIAMOND	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD332 [Filed]	METHOD OF MAKING DIAMOND TOOL	United States	US	S/N: 713966 P/N: 4661180	25-Mar-85		
60SD333 [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 153466 P/N: 4828582	3-Feb-88		
60SD333V [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 793462 P/N: 4828582	1-Sep-88		
60SD358 [Filed]	PRODUCTS AND PROCESS FOR MAKING MULTIGRAIN ABRASIVE COMPACTS	United States	US	S/N: 07/669259 P/N: 5211726	14-Mar-91		
60SD364 [Filed]	MULTIGRAIN ABRASIVE PARTICLES	United States	US	S/N: 07/669124 P/N: 5106392	14-Mar-91		
60SD367 [Filed]	CHIP BREAKER FOR POLYCRYSTALLINE CBN AND DIAMOND COMPACTS	United States	US	S/N: 7/429661 P/N: 5026960	31-Oct-89		
60SD368 [Filed]	DIAMOND AND CUBIC BORON NITRIDE	United States	US	S/N: 156272 P/N: 4807402	12-Feb-88		
60SD389 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANKS	United States	US	S/N: 328347 P/N: D330206	24-Mar-89		
60SD390 [Filed]	RECIPROCATING POINT ROTARY DIAMOND	United States	US	S/N: 07/635082 P/N: 5172681	28-Dec-90		
60SD401 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332814 P/N: D325226	3-Apr-89		
60SD412 [Filed]	SAWBLADE SEGMENTS UTILIZING POLYCRYSTALLINE DIAMOND GRIT	United States	US	S/N: 262405 P/N: 4883500	25-Oct-88		
60SD419 [Filed]	SUPPORTED THERMALLY STABLE CUBIC BORON NITRIDE TOOLS BLANKS AND METHOD FOR MAKING THE SAME	United States	US	S/N: 7/394349 P/N: 4985050	15-Aug-89		
60SD428 [Filed]	DIAMOND COMPACTS FOR ROCK DRILLING AND MACHINING	United States	US	S/N: 7/420191 P/N: 5022894	12-Oct-89		
60SD437 [Filed]	METHOD FOR PRODUCING POLYCRYSTALLINE COMPACT TOOL BLANKS WITH FLAT CARBIDE SUPPORT/DIAMOND OR CBN INTERFACES	United States	US	S/N: 331928 P/N: 4954139	31-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 328348 P/N: D324527	24-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 7/328348 P/N: 324527	24-Mar-89		
60SD440 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332828 P/N: D324056	3-Apr-89		
60SD455 [Filed]	CBN/CBN COMPOSITE MASSES AND THEIR PREPARATION	United States	US	S/N: 7/630916 P/N: 5106792	20-Dec-90		
60SD458 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES FOR SINTERED METAL BONDED TOOLS	United States	US	S/N: 07/857132 P/N: 5250086	25-Mar-92		

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60SD461 [Filed]	BRAZED THERMALLY-STABLE POLYCRSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 365268 P/N: 4931363	12-Jun-89		
60SD469 [Filed]	POLYCRYSTALLINE CVD DIAMOND SUBSTRATE FOR SINGLE CRYSTAL EPITAXIAL GROWTH OF SEMICONDUCTORS FORMERLY	United States	US	S/N: 07/479486 P/N: 4981818	13-Feb-90		
60SD493 [Filed]	CVD DIAMOND COATED ANNULUS COMPONENTS AND THEIR METHOD OF FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/563367 P/N: 5096736	7-Aug-90		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/929239 P/N: 5256206	14-Aug-92		
60SD499 [Filed]	CVD DIAMOND COATED TWIST DRILLS	United States	US	S/N: 07/555879 P/N: 5022801	18-Jul-90		
60SD504 [Filed]	USING THERMALLY-STABLE DIAMOND OR CBN COMPACTS AS TIPS FOR ROTARY DRILLS	United States	US	S/N: 07/577379 P/N: 5273557	4-Sep-90		
60SD506 [Filed]	ISOTOPICALLY PURE SINGLE CRYSTAL EPITAXIAL DIAMOND FILMS AND THEIR PREPARATION	United States	US	S/N: 07/547651 P/N: 5360479	2-Jul-90		
60SD518 [Filed]	THERMALLY STABLE DENSE ELECTRICALLY CONDUCTIVE DIAMOND COMPACTS	United States	US	S/N: 07/773461 P/N: 5266236	9-Oct-91		
60SD528 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD567 [Filed]	CHEMICALLY BONDED ADHERENT COATING FOR ABRASIVE COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/710725 P/N: 5173091	4-Jun-91		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 08/220946 P/N: 5523121	31-Mar-94		
60SD577 [Filed]	CARBON FLUORIDE COMPOSITIONS	United States	US	S/N: 08/073991 P/N: 5380557	3-Jun-93		
60SD578 [Filed]	METHOD FOR MAKING SMOOTH SUBSTRATE MANDRELS	United States	US	S/N: 07/815478 P/N: 5176803	4-Mar-92		
60SD581 [Filed]	METHOD FOR PRODUCING UNIFORM CYLINDRICAL TUBES OF CVD DIAMOND	United States	US	S/N: 08/138888 P/N: 5387447	19-Oct-93		
60SD582 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD583 [Filed]	COATING FOR IMPROVED RETENTION OF CBN IN VITREOUS BOND MATRICES	United States	US	S/N: 08/005951 P/N: 5300129	19-Jan-93		
60SD584 [Filed]	DUAL-COATED DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/762999 P/N: 5143523	20-Sep-91		
60SD615 [Filed]	METHOD FOR CONTROLLING THE PARTICLE SIZE DISTRIBUTION IN THE PRODU CTION OF MULTICRYSTALLINE CUBIC BORON NITR IDE	United States	US	S/N: 07/995229 P/N: 5985228	22-Dec-92		
60SD628 [Filed]	DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/857192 P/N: 5405573	4-May-92		
60SD633 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES WITH AN ELECTROLESSLY DEPOSITED METAL LAYER	United States	US	S/N: 07/857139 P/N: 5232469	25-Mar-92		

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60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/322841 P/N: 5510193	13-Oct-94		
60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/595715 P/N: 5603070	2-Feb-96		
60SD645 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD647 [Filed]	FINE GRAIN DIAMOND WORKPIECES	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/095631 P/N: 5484330	21-Jul-93		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD653 [Filed]	REDUCTION OF STRESSES IN THE POLYCRYSTALLINE ABRASIVE LAYER OF A C OMPOSITE COMPACT IN THE IN SITU BONDED CAR BIDE/CARBIDE SUPPORT	United States	US	S/N: 08/489877 P/N: 5560754	13-Jun-95		
60SD658 [Filed]	ABRASIVE TOOL INSERT SEE CIP	United States	US	S/N: 08/105523 P/N: 5494477	11-Aug-93		
60SD660 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 07/985500 P/N: 5320988	1-Dec-92		
60SD662 [Filed]	METHOD OF SEPARATION OF PIECES FROM SUPER HARD MATERIAL BY PARTIAL LASER CUT AND PRESSURE CLEAVAGE	United States	US	S/N: 08/060459 P/N: 5387776	11-May-93		
60SD664 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD665 [Filed]	MEASURING THE STRENGTH OF ABRASIVE GRAINS	United States	US	S/N: 08/016638 P/N: 5392633	12-Feb-93		
60SD669 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD690 [Filed]	MULTIPLE GRAINED DIAMOND WIRE DIE	United States	US	S/N: 08/143802 P/N: 5361621	27-Oct-93		
60SD691 [Filed]	OPTICALLY IMPROVED DIAMOND WIRE DIE	United States	US	S/N: 08/148803 P/N: 5465603	5-Nov-93		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 08/571312 P/N: 5855996	12-Dec-95		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 09/087776 P/N: 6132675	29-May-98		
60SD694 [Filed]	DIAMOND WIRE DIE	United States	US	S/N: 08/121014 P/N: 5363687	14-Sep-93		
60SD696 [Filed]	ABRASIVE TOOL INSERT	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD698 [Filed]	CVD DIAMOND COATING ANNULUS COMPONENTS AND METHOD OF THEIR FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD701 [Filed]	DIAMOND WIRE DIE WITH POSITIONED OPENING	United States	US	S/N: 08/144168 P/N: 5377522	27-Oct-93		
60SD708 [Filed]	A METHOD FOR MANUFACTURING A DIAMOND ARTICLE	United States	US	S/N: 08/310449 P/N: 5529805	22-Sep-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/286076 P/N: 5500248	4-Aug-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/583360 P/N: 5647878	5-Jan-96		

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60SD712 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/238543 P/N: 5451430	5-May-94		
60SD713 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/654815 P/N: 5672395	29-May-96		
60SD714 [Filed]	ANNULAR DIAMOND BODIES	United States	US	S/N: 08/311658 P/N: 5551277	23-Sep-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/239156 P/N: 5512235	6-May-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/616997 P/N: 5773140	14-Mar-96		
60SD721 [Filed]	WIRE DRAWING DIE HAVING IMPROVED PHYSICAL PROPERTIES NO DIVISIONAL DUE PER GLL	United States	US	S/N: 08/412050 P/N: 5660075	28-Mar-95		
60SD726 [Filed]	A FINE GRAIN DIAMOND TOOL AND METHOD OF MANUFACTURE	United States	US	S/N: 08/551593 P/N: 5660936	1-Nov-95		
60SD728 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD731 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD732 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD745 [Filed]	METHOD FOR PRODUCING UNIFORMLY HIGH QUALITY ABRASIVE COMPACTS	United States	US	S/N: 08/555672 P/N: 5669944	13-Nov-95		
60SD749 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH REDUCED FAILURE DURING BRAZING	United States	US	S/N: 08/975028 P/N: 6042463	20-Nov-97		
60SD750 [Filed]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT NO DIV DUE PER EPA 5/1/97	United States	US	S/N: 08/591879 P/N: 5662720	26-Jan-96		
60SD752 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT (PDC) CUTTER WITH IMPROVED CUTTING CAPABILITY	United States	US	S/N: 08/975429 P/N: 6045440	20-Nov-97		
60SD753 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH IMPROVED CUTTING BY PREVENTING CHIP BUILD UP	United States	US	S/N: 09/131460 P/N: 6196910	10-Aug-98		
60SD760A [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT	United States	US	S/N: 08/777213 P/N: 5848657	27-Dec-96		
60SD768 [Filed]	AN IMPROVED ABRASIVE CUTTING ELEMENT AND DRILL BIT	United States	US	S/N: 08/611896 P/N: 5743346	6-Mar-96		
60SD769 [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT WITH DIAMOND RIDGE PATTERN	United States	US	S/N: 08/777222 P/N: 5829541	27-Dec-96		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 08/779417	7-Jan-97		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 10/411471	8-Apr-03		
60SD774 [Filed]	METHOD FOR PRODUCING CUBIC BORON NITRIDE USING MELAMINE AS A CATALYST	United States	US	S/N: 09/072144 P/N: 5869015	4-May-98		
60SD784 [Filed]	SYNTHETIC GASKET MATERIAL FOR USE IN HIGH PRESSURE PRESSES TRANS FM/MEGADIAMOND	United States	US	S/N: 08/874769 P/N: 5858525	13-Jun-97		

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60SD785 [Filed]	THERMALLY-DIFFUSED BORON DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/561128 P/N: 6322891	28-Apr-00		
60SD787 [Filed]	SUPERABRASIVE CUTTING ELEMENT WITH ENHANCED STIFFNESS, THERMAL CON DUCTIVITY AND CUTTING EFFICIENCY	United States	US	S/N: 08/783171 P/N: 6009963	14-Jan-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 08/950004 P/N: 5957005	14-Oct-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 09/358271 P/N: 6314836	21-Jul-99		
60SD794 [Filed]	AXISYMMETRIC CUTTING ELEMENT	United States	US	S/N: 09/492095 P/N: 6260640	27-Jan-00		
60SD795 [Filed]	SHAPED POLYCRYSTALLINE CUTTER ELEMENTS	United States	US	S/N: 09/072471 P/N: 6102143	4-May-98		
60SD796 [Filed]	TITANIUM CHROMIUM ALLOY COATED DIAMOND CRYSTALS FOR USE IN SAW BLA DE SEGMENTS AND METHOD FOR THEIR PRODUCTIO N	United States	US	S/N: 09/570957 P/N: 6319608	15-May-00		
60SD802 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORLESS AND FANCY COLORED DIAMONDS	United States	US	S/N: 10/338136	8-Jan-03		
60SD805 [Filed]	HIGH PRESSURE APPARATUS HAVING TRANSITION SLOPE BINDING RING THAT MITIGATES TENSILE STRESSES AND CORRESPONDI NG METHOD	United States	US	S/N: 09/740777 P/N: 6375446	19-Dec-00		
60SD806 [Filed]	LOW OXYGEN CUBIC BORON NITRIDE	United States	US	S/N: 10/001573	2-Nov-01		
60SD811 [Filed]	CRYSTAL MIXING FOR LOW POWER GRINDING	United States	US	S/N: 09/988244	16-Nov-01		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 60/139654	17-Jun-99		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 10/014547	14-Dec-01		
60SD817 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORED DIAMONDS	United States	US	S/N: 10/069362	25-Aug-00		
60SD820 [Filed]	SURFACE MODIFICATION OF COATED ABRASIVES TO ENHANCE THEIR ADHESION IN RESIN BOND TOOLS	United States	US	S/N: 09/901159	9-Jul-01		
60SD827 [Filed]	ABRASIVE TOOL INSERTS AND THEIR PRODUCTION	United States	US	S/N: 09/845540 P/N: 6315652	30-Apr-01		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 60/224485	11-Aug-00		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 10/344249	11-Feb-03		
60SD838 [Filed]	SILVER-COATED ABRASIVES, TOOLS CONTAINING SILVER-COATED ABRASIVES, AND APPLICATIONS OF THESE TOOLS	United States	US	S/N: 09/776141 **P/N: 6666753**	2-Feb-01		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/737667	15-Dec-00		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/799192	5-Mar-01		
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/935957	23-Aug-01		

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60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 10/262784	2-Oct-02		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 09/987863 P/N: 6475254	16-Nov-01		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 10/174914 P/N: 6596040	19-Jun-02		
60SD852 [Filed]	HIGH PRESSURE PRODUCTION OF PEROVSKITES	United States	US	S/N: 09/931312	16-Aug-01		
RD14877 [Filed]	SINTERED POLYCRYSTALLINE DIAMOND COMPACT CONSTRUCTION WITH INTEGRA L HEAT SINK	United States	US	S/N: 652242 P/N: 4605343	20-Sep-84		
RD16334 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 830414 P/N: 4690691	13-Feb-86		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 07/332914 P/N: 5261959	4-Apr-89		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 08/150633 P/N: 5516554	10-Nov-93		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 48176 P/N: 4797138	11-May-87		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 07/048176 P/N: 4797138	11-May-87		
RD18116 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 07/744815 P/N: 5310447	12-Aug-91		
RD18402 [Filed]	EXCIMER LASER PATTERNING OF A NOVEL RESIST	United States	US	S/N: 224416 P/N: 4842677	26-Jul-88		
RD18693 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUB STRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/407179 P/N: 5110579	14-Sep-89		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD19567 [Filed]	FREE STANDING DIAMOND SHEET AND METHOD AND APPARATUS FOR MAKING SA ME	United States	US	S/N: 07/537963 P/N: 5464071	13-Jun-90		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/163608 P/N: 5419276	6-Dec-93		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/368732 P/N: 5540904	4-Jan-95		
RD20790 [Filed]	APPARATUS FOR PRODUCING DIAMONDS BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD20983 [Inactivated]	ARTIFICIAL POLYMER LATICES IN CORE-SHELL FORM AND METHOD OF PREPARATION	United States	US	S/N: 07/980,444 P/N: 5356955	23-Nov-93		
RD21018 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUBSTRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD21033 [Filed]	IMPROVED METHOD OF APPLYING METAL COATINGS ON DIAMOND AND ARTICLES MADE THEREFROM	United States	US	S/N: 07/722575 P/N: 5190796	27-Jun-91		

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RD21034 [Inactivated]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD21356 [Filed]	METHOD FOR PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION	United States	US	S/N: 07/845992 P/N: 5175929	4-Mar-92		
RD21493 [Filed]	METHOD OF APPLYING METAL COATING ON CUBIC ORON NITRIDE AND ARTICLE S MADE THEREFROM	United States	US	S/N: 07/738758 P/N: 5188643	1-Aug-91		
RD21661 [Filed]	PREHEATER FOR CVD DIAMOND REACTOR	United States	US	S/N: 08/306077 P/N: 5479874	14-Sep-94		
RD21796 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		
RD22021 [Filed]	SUBSTANTIALLY TRANSPARENT FREE STANDING DIAMOND FILMS	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD22055 [Filed]	METHOD FOR DETERMINING THICKNESS OF CHEMICAL VAPOR DEPOSITED LAYERS	United States	US	S/N: 07/991798 P/N: 5300313	16-Dec-92		
RD22294 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD22486 [Filed]	APPARATUS FOR PRODUCING DIAMOND BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD22514 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING GRAPHITE SUBSTRATE HOLDERS	United States	US	S/N: 08/096392 P/N: 5391229	26-Jul-93		
RD22530 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING THERM AL SPREADER	United States	US	S/N: 08/172797 P/N: 5397396	27-Dec-93		
RD22721 [Filed]	POLYCRYSTALLINE CARBON CONVERSION	United States	US	S/N: 09/206721 P/N: 6126741	7-Dec-98		
RD22800 [Filed]	TUNGSTEN METALIZATION OF CVD DIAMOND	United States	US	S/N: 08/100406 P/N: 5346719	2-Aug-93		
RD22976 [Filed]	METHOD FOR MAKING HIGH THERMAL CONDUCTING DIAMOND	United States	US	S/N: 08/316995 P/N: 5445106	3-Oct-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD23162 [Filed]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD23356 [Filed]	CHEMICAL VAPOR DEPOSITION OF POLYCRYSTALLINE DIAMOND WITH OR IENTATION AND GROWTH FACETS	United States	US	S/N: 08/264268 P/N: 5437891	23-Jun-94		
RD23427 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD23481 [Filed]	DIAMOND OPTICAL PLATE BEAMSPLITTER	United States	US	S/N: 08/538656 P/N: 5706135	3-Oct-95		
RD23502 [Filed]	APPARATUS FOR ANNEALING DIAMOND WATER JET MIXING TUBES	United States	US	S/N: 08/267181 P/N: 5468934	15-Jun-94		
RD23503 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD23511 [Filed]	ARTICLES HAVING THERMAL CONDUCTORS OF GRAPHITE	United States	US	S/N: 08/262796 P/N: 5494753	20-Jun-94		
RD23716 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		

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RD23717 [Filed]	ULTRAFAST OPTICAL MODULATOR	United States	US	S/N: 08/605417 P/N: 5659415	22-Feb-96		
RD23819 [Filed]	FABRICATION OF BRAZABLE IN AIR TOOL INSERTS AND INSERTS FABRICATED THEREBY	United States	US	S/N: 08/350572 P/N: 5626909	7-Dec-94		
RD23927 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499238 P/N: 5634369	7-Jul-95		
RD23948 [Filed]	DIAMOND FILM STRUCTURE WITH HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/316998 P/N: 5525815	3-Oct-94		
RD24002 [Filed]	SYNTHETIC DIAMOND PRODUCT	United States	US	S/N: 08/411181 P/N: 5503104	27-Mar-95		
RD24111 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD24416 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499237 P/N: 5636545	7-Jul-95		
RD24447 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499502 P/N: 5634370	7-Jul-95		
RD24450 [Filed]	ELECTRONIC APPARATUS WITH COMPLIANT METAL CHIP-SUBSTRATE BONDING LAYER(S)	United States	US	S/N: 08/457551 P/N: 5567985	1-Jun-95		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/201384 P/N: 6152977	30-Nov-98		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/484389 P/N: 6350191	14-Jan-00		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING S AME	United States	US	S/N: 09/484392 P/N: 6406776	14-Jan-00		
RD25308 [Filed]	SURFACE ENRICHED DIAMOND AND METHOD OF MAKING	United States	US	S/N: 09/783441	14-Feb-01		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/472104 P/N: 6258721	27-Dec-99		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/591189 P/N: 6242351	9-Jun-00		
RD27642 [Filed]	METHOD OF DETECTION OF NATURAL DIAMONDS THAT HAVE BEEN PROCESSED A T HIGH PRESSURE AND HIGH TEMPERATURES	United States	US	S/N: 09/430477 P/N: 6377340	29-Oct-99		
RD27888 [Filed]	FUNCTIONALIZED DIAMONDS WITH ENHANCED RETENTION IN RESIN BONDS, REACTIONS AND METHODS FOR PRODUCING SAME, AND ABRASIVES USING FUNCTIONALIZED DIAMONDS	United States	US	S/N: 09/576794 P/N: 6372002	23-May-00		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 09/793312 P/N: 6541115	26-Feb-01		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 10/255431	26-Sep-02		
RD28271 [Filed]	ABRASIVE DIAMOND COMPOSITE AND METHOD OF MAKING THEREOF	United States	US	S/N: 09/729525	4-Dec-00		
134047 [Filed]	METHOD TO STABILIZE FRAME SAW BLADES DURING CUT INITIATION	United States	US	134047 -1 Provisional [Filed]	14-Aug-03		

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[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH DISCRETE PARTICLE SIZE AREAS	United States	US	[Issued] S/N: 09/167,196 P/N: 6,187,068	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT AND THERMAL STABILITY	United States	US	[Issued] S/N: 08/523,868 P/N: 5,645,617	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE COMPACT WITH IMPROVED FRACTURE AND DELAMINATION RESISTANCE	United States	US	[Issued] S/N: 08/415,693 P/N: 5,564,511	[Awaiting]		
[Awaiting]	HIGH PRESSURE/HIGH TEMPERATURE PISTON-CYLINDER APPARATUS	United States	US	[Issued] S/N: 07/792,716 P/N: 5,244,368	[Awaiting]		
[Awaiting]	HIGH PRESSURE REACTION VESSEL	United States	US	[Issued] S/N: 07/826,809 P/N: 5,236,674	[Awaiting]		
[Awaiting]	MODIFIED END ASSEMBLY FOR HIGH PRESSURE, HIGH TEMPERATURE REACTION VESSELS	United States	US	[Issued] S/N: 07/660,332 P/N: 5,190,734	[Awaiting]		
[Awaiting]	HIGH STRENGTH COMPOSITE COMPONENT AND METHOD OF FABRICATION	United States	US	[Issued] S/N: 07/153,725 P/N: 5,032,147	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT RESISTANCE	United States	US	[Issued] S/N: 07/390,208 P/N: 5,011,515	[Awaiting]		
[Awaiting]	COMPOSITE COMPACT WITH A MORE THERMALLY STABLE CUTTING EDGE AND METHOD OF MANUFACTURING THE SAME	United States	US	[Issued] S/N: 07/390,204 P/N: 5,011,509	[Awaiting]		
[Awaiting]	COMPOSITE ABRASIVE COMPACT HAVING HIGH THERMAL STABILITY AND TRANSVERSE RUPTURE STRENGTH	United States	US	[Issued] S/N: 07/151,942 P/N: 4,871,377	[Awaiting]		
[Awaiting]	MATRIX CUTTER	United States	US	[Filed] S/N: 10/183,098	[Awaiting]		
[Awaiting]	ENHANCED METHOD FOR MAKING CVD DIAMOND	United States	US	[Filed] S/N: 10/161,266	[Awaiting]		

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112200 [Filed]	POLYCRYSTALLINE DIAMOND TIPS ON CUTTERS FOR HIGH SPEED DISC SAWHEADS FOR APPLICATION IN THE TIMBER INDUSTRY	United States	US	Provisional [Filed] S/N: 60/473511	23-May-03		
123571 [Filed]	AUTOCATALYTIC NICKEL-BORON COATING PROCESS FOR DIAMOND PARTICLES	United States	US	Provisional [Filed] S/N: 60/438957	9-Jan-03		
123989 [Filed]	LASER SUPPORT NICKEL-PLATING OF SUPERABRASIVE TOOL	United States	US	S/N: 10/172,034	14-Jun-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	Provisional [Filed] S/N: 60/395,182	10-Jul-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	S/N: 10/458903 **P/N: 6666753**	11-Jun-03		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	Provisional [Filed] S/N: 60/395,181	10-Jul-02		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	S/N: 10/455008	5-Jun-03		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	Provisional [Filed] S/N: 60/432222	10-Dec-02		
125185 [Filed]	**METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE**	**United States**	**US**		**9-Dec-03**		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	Provisional [Filed] S/N: 60/382209	21-May-02		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	S/N: 10/437469	8-Jul-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	125877 -7 Original [Filed]			
126337 [Filed]	SCRATCH-PROOF COMPOSITE WATCH GLASS	United States	US	Provisional [Filed] S/N: 60/399778	31-Jul-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	Provisional [Filed] S/N: 60/391707	26-Jun-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	S/N: 10/437516	14-May-03		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	Provisional [Filed] S/N: 60/414987	1-Oct-02		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US		17-Jul-03		
129177 [Filed]	EXTRUSION AND COMPOUNDING EQUIPMENT COMPONENTS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445631	7-Feb-03		
129178 [Filed]	IMPROVED WEAR RESISTANT COMPONENTS FOR SIZE REDUCTION AND SIZE CLASSIFICATION EQUIPMENT	United States	US	Provisional [Filed] S/N: 60/445615	7-Feb-03		

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129182 [Filed]	WEAR CONTROL IN CONTINUOUS GLASS FIBER PLANTS	United States	US	Provisional [Filed] S/N: 60/445614	7-Feb-03		
129184 [Filed]	WEAR-RESISTANT DRILL BIT BODIES AND OTHER COMPONENTS FOR OIL AND GAS DRILLING	United States	US	Provisional [Filed] S/N: 60/445659	7-Feb-03		
129892 [Filed]	WEAR AND CORROSION RESISTANT ORIFICE AND RELATED COMPONENTS	United States	US	Provisional [Filed] S/N: 60/445633	7-Feb-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/440455	15-Jan-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/464517	22-Apr-03		
131068 [Filed]	WEAR AND CORROSION PREVENTION IN FIREARMS	United States	US	Provisional [Filed] S/N: 60/445609	7-Feb-03		
132255 [Filed]	AIRCRAFT ENGINE WEAR PARTS	United States	US	Provisional [Filed] S/N: 60/445632	7-Feb-03		
132270 [Filed]	CLIPPER BLADE SETS AND COMBS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445610	7-Feb-03		
132875 [Filed]	**SELECTION OF DIAMONDS GRIT MORPHOLOGY AND SIZE DISTRIBUTION FOR CMP CONDITIONER APPLICATION**	**United States**	**US**	**Provisional [Filed]**	**8-Oct-03**		
133139 [Filed]	IMPROVED WEAR PEROFRMANCE TOOLS FOR METAL, PLASTIC, CERAMIC AND COMPOSITE FORMING	United States	US	Provisional [Filed] S/N: 60/447808	14-Feb-03		
133140 [Filed]	PCD AND PCBN TOOL BLANKS WITH PREFIXED BRAZE ALLOY	United States	US	Provisional [Filed] S/N: 60/445613	7-Feb-03		
133141 [Filed]	COATINGS WITH HIGHLY TORTUOUS SURFACE TOPOGRAPHY FOR ABRASIVE/SUPERABRASIVE PARTICLES USED IN METALS/CERAMIC/POLYMER MATRIX COMPOSITES	United States	US	Provisional [Filed] S/N: 60/469285	8-May-03		
133615 [Filed]	IMPROVED TOOLS FOR MACHINING FIBER CEMENTS	United States	US	Provisional [Filed]	11-Mar-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	Provisional [Filed] S/N: 60/470306	14-May-03		
133794 [Filed]	**SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION**	**United States**	**US**		**22-Oct-03**		
133920 [Filed]	DRILL BITS, ROUTER BITS, PROFILE CUTTERS, FILES, PLANING AND SAW BLADES WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/469287	9-May-03		
133975 [Filed]	METHOD TO IMPROVE TOOL INTEGRITY WHEN CUTTING STONE	United States	US	Provisional [Filed]	14-Aug-03		
135143 [Filed]	A METHOD OF MAKING ABRASIVE TOOLS FROM BI-MODAL DIAMOND OR CUBIC BORON NITRIDE POWDER	United States	US	Provisional [Filed] S/N: 60/467311	2-May-03		

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136255 [Filed]	SINTERED COMPACT FOR USE IN MACHINING VARIOUS CAST IRON MATERIALS	United States	US	Provisional [Filed]	3-Dec-03		
145361 [Filed]	COMPRESSION CONTAINER FOR POLYCRYSTALLINE WIRE DIE	United States	US	Provisional [Filed]	10-Dec-03		
60SD10 [Filed]	DIAMOND AND CBN ABRASIVE COMPACTS USING SIZE SELECTIVE ABRASIVE PA RTICLE LAYERS	United States	US	S/N: 219289 P/N: 4311490	7-Sep-88		
60SD147 [Filed]	RE-SINTERED BORON-RICH POLYCRYSTALLINE CUBIC BORON NITRIDE AND MET HOD FOR MAKING SAME	United States	US	S/N: 823893 P/N: 4673414	29-Jan-86		
60SD184 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD240 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 542081 P/N: 4525179	14-Oct-83		
60SD242 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD245 [Filed]	MERGED WITH 60-SD-259 FOR FILING	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD24559 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD246 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD249 [Filed]	SWEEP THROUGH PROCESS FOR MAKING POLYCRYSTALLINE COMPACTS	United States	US	S/N: 536221 P/N: 4518659	23-Sep-83		
60SD251 [Filed]	IMPROVED PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 552081 P/N: 4525179	14-Oct-83		
60SD254 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 06/920041 P/N: 4738689	16-Oct-86		
60SD256 [Filed]	POLYCRYSTALLINE SANDWICH COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/277875 P/N: 5009673	30-Nov-88		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 697668 P/N: 4810447	4-Feb-85		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 8491 P/N: 4832708	27-Jan-87		
60SD261 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 7/366943 P/N: 5043120	16-Jun-89		
60SD262 [Filed]	BRAZED COMPOSITE COMPACT IMPLEMENTS	United States	US	S/N: 624064 P/N: 4527998	25-Jun-84		
60SD303 [Filed]	REFRACTORY METAL OXIDE COATED ABRASIVES AND GRINDING WHEELS MADE THEREFROM	United States	US	S/N: 07/358728 P/N: 4951427	30-May-89		
60SD305 [Filed]	STUD-MOUNTED POLYCRYSTALLINE TOOTHED DIAMOND CUTTING BLANKS	United States	US	S/N: 7/192872 P/N: D317010	11-May-88		
60SD308 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 7/365268 P/N: 4931363	12-Jun-89		

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60SD30811 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 158575 P/N: 4899922	22-Feb-88		
60SD317 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 920041 P/N: 47386689	16-Oct-86		
60SD318 [Filed]	BONDING OF THERMALLY STABLE ABRASIVE COMPACTS TO CARBIDE SUPPORTS	United States	US	S/N: 07/158336 P/N: 4850523	22-Feb-88		
60SD327 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 008491 P/N: 4832708	29-Jan-87		
60SD33 [Filed]	OPTICAL WINDOWS MADE OF POLYCRYSTALLINE ADAMANTANE BORON NITRIDE OR DIAMOND	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD332 [Filed]	METHOD OF MAKING DIAMOND TOOL	United States	US	S/N: 713966 P/N: 4661180	25-Mar-85		
60SD333 [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 153466 P/N: 4828582	3-Feb-88		
60SD333V [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 793462 P/N: 4828582	1-Sep-88		
60SD358 [Filed]	PRODUCTS AND PROCESS FOR MAKING MULTIGRAIN ABRASIVE COMPACTS	United States	US	S/N: 07/669259 P/N: 5211726	14-Mar-91		
60SD364 [Filed]	MULTIGRAIN ABRASIVE PARTICLES	United States	US	S/N: 07/669124 P/N: 5106392	14-Mar-91		
60SD367 [Filed]	CHIP BREAKER FOR POLYCRYSTALLINE CBN AND DIAMOND COMPACTS	United States	US	S/N: 7/429661 P/N: 5026960	31-Oct-89		
60SD368 [Filed]	DIAMOND AND CUBIC BORON NITRIDE	United States	US	S/N: 156272 P/N: 4807402	12-Feb-88		
60SD389 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANKS	United States	US	S/N: 328347 P/N: D330206	24-Mar-89		
60SD390 [Filed]	RECIPROCATING POINT ROTARY DIAMOND	United States	US	S/N: 07/635082 P/N: 5172681	28-Dec-90		
60SD401 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332814 P/N: D325226	3-Apr-89		
60SD412 [Filed]	SAWBLADE SEGMENTS UTILIZING POLYCRYSTALLINE DIAMOND GRIT	United States	US	S/N: 262405 P/N: 4883500	25-Oct-88		
60SD419 [Filed]	SUPPORTED THERMALLY STABLE CUBIC BORON NITRIDE TOOLS BLANKS AND METHOD FOR MAKING THE SAME	United States	US	S/N: 7/394349 P/N: 4985050	15-Aug-89		
60SD428 [Filed]	DIAMOND COMPACTS FOR ROCK DRILLING AND MACHINING	United States	US	S/N: 7/420191 P/N: 5022894	12-Oct-89		
60SD437 [Filed]	METHOD FOR PRODUCING POLYCRYSTALLINE COMPACT TOOL BLANKS WITH FLAT CARBIDE SUPPORT/DIAMOND OR CBN INTERFACES	United States	US	S/N: 331928 P/N: 4954139	31-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 328348 P/N: D324527	24-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 7/328348 P/N: 324527	24-Mar-89		
60SD440 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332828 P/N: D324056	3-Apr-89		
60SD455 [Filed]	CBN/CBN COMPOSITE MASSES AND THEIR PREPARATION	United States	US	S/N: 7/630916 P/N: 5106792	20-Dec-90		
60SD458 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES FOR SINTERED METAL BONDED TOOLS	United States	US	S/N: 07/857132 P/N: 5250086	25-Mar-92		

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60SD461 [Filed]	BRAZED THERMALLY-STABLE POLYCRSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 365268 P/N: 4931363	12-Jun-89		
60SD469 [Filed]	POLYCRYSTALLINE CVD DIAMOND SUBSTRATE FOR SINGLE CRYSTAL EPITAXIAL GROWTH OF SEMICONDUCTORS FORMERLY	United States	US	S/N: 07/479486 P/N: 4981818	13-Feb-90		
60SD493 [Filed]	CVD DIAMOND COATED ANNULUS COMPONENTS AND THEIR METHOD OF FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/563367 P/N: 5096736	7-Aug-90		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/929239 P/N: 5256206	14-Aug-92		
60SD499 [Filed]	CVD DIAMOND COATED TWIST DRILLS	United States	US	S/N: 07/555879 P/N: 5022801	18-Jul-90		
60SD504 [Filed]	USING THERMALLY-STABLE DIAMOND OR CBN COMPACTS AS TIPS FOR ROTARY DRILLS	United States	US	S/N: 07/577379 P/N: 5273557	4-Sep-90		
60SD506 [Filed]	ISOTOPICALLY PURE SINGLE CRYSTAL EPITAXIAL DIAMOND FILMS AND THEIR PREPARATION	United States	US	S/N: 07/547651 P/N: 5360479	2-Jul-90		
60SD518 [Filed]	THERMALLY STABLE DENSE ELECTRICALLY CONDUCTIVE DIAMOND COMPACTS	United States	US	S/N: 07/773461 P/N: 5266236	9-Oct-91		
60SD528 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD567 [Filed]	CHEMICALLY BONDED ADHERENT COATING FOR ABRASIVE COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/710725 P/N: 5173091	4-Jun-91		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 08/220946 P/N: 5523121	31-Mar-94		
60SD577 [Filed]	CARBON FLUORIDE COMPOSITIONS	United States	US	S/N: 08/073991 P/N: 5380557	3-Jun-93		
60SD578 [Filed]	METHOD FOR MAKING SMOOTH SUBSTRATE MANDRELS	United States	US	S/N: 07/815478 P/N: 5176803	4-Mar-92		
60SD581 [Filed]	METHOD FOR PRODUCING UNIFORM CYLINDRICAL TUBES OF CVD DIAMOND	United States	US	S/N: 08/138888 P/N: 5387447	19-Oct-93		
60SD582 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD583 [Filed]	COATING FOR IMPROVED RETENTION OF CBN IN VITREOUS BOND MATRICES	United States	US	S/N: 08/005951 P/N: 5300129	19-Jan-93		
60SD584 [Filed]	DUAL-COATED DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/762999 P/N: 5143523	20-Sep-91		
60SD615 [Filed]	METHOD FOR CONTROLLING THE PARTICLE SIZE DISTRIBUTION IN THE PRODU CTION OF MULTICRYSTALLINE CUBIC BORON NITR IDE	United States	US	S/N: 07/995229 P/N: 5985228	22-Dec-92		
60SD628 [Filed]	DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/857192 P/N: 5405573	4-May-92		
60SD633 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES WITH AN ELECTROLESSLY DEPOSITED METAL LAYER	United States	US	S/N: 07/857139 P/N: 5232469	25-Mar-92		

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60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/322841 P/N: 5510193	13-Oct-94		
60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/595715 P/N: 5603070	2-Feb-96		
60SD645 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD647 [Filed]	FINE GRAIN DIAMOND WORKPIECES	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/095631 P/N: 5484330	21-Jul-93		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD653 [Filed]	REDUCTION OF STRESSES IN THE POLYCRYSTALLINE ABRASIVE LAYER OF A C OMPOSITE COMPACT IN THE IN SITU BONDED CAR BIDE/CARBIDE SUPPORT	United States	US	S/N: 08/489877 P/N: 5560754	13-Jun-95		
60SD658 [Filed]	ABRASIVE TOOL INSERT SEE CIP	United States	US	S/N: 08/105523 P/N: 5494477	11-Aug-93		
60SD660 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 07/985500 P/N: 5320988	1-Dec-92		
60SD662 [Filed]	METHOD OF SEPARATION OF PIECES FROM SUPER HARD MATERIAL BY PARTIAL LASER CUT AND PRESSURE CLEAVAGE	United States	US	S/N: 08/060459 P/N: 5387776	11-May-93		
60SD664 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD665 [Filed]	MEASURING THE STRENGTH OF ABRASIVE GRAINS	United States	US	S/N: 08/016638 P/N: 5392633	12-Feb-93		
60SD669 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD690 [Filed]	MULTIPLE GRAINED DIAMOND WIRE DIE	United States	US	S/N: 08/143802 P/N: 5361621	27-Oct-93		
60SD691 [Filed]	OPTICALLY IMPROVED DIAMOND WIRE DIE	United States	US	S/N: 08/148803 P/N: 5465603	5-Nov-93		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 08/571312 P/N: 5855996	12-Dec-95		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 09/087776 P/N: 6132675	29-May-98		
60SD694 [Filed]	DIAMOND WIRE DIE	United States	US	S/N: 08/121014 P/N: 5363687	14-Sep-93		
60SD696 [Filed]	ABRASIVE TOOL INSERT	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD698 [Filed]	CVD DIAMOND COATING ANNULUS COMPONENTS AND METHOD OF THEIR FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD701 [Filed]	DIAMOND WIRE DIE WITH POSITIONED OPENING	United States	US	S/N: 08/144168 P/N: 5377522	27-Oct-93		
60SD708 [Filed]	A METHOD FOR MANUFACTURING A DIAMOND ARTICLE	United States	US	S/N: 08/310449 P/N: 5529805	22-Sep-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/286076 P/N: 5500248	4-Aug-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/583360 P/N: 5647878	5-Jan-96		

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60SD712 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/238543 P/N: 5451430	5-May-94		
60SD713 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/654815 P/N: 5672395	29-May-96		
60SD714 [Filed]	ANNULAR DIAMOND BODIES	United States	US	S/N: 08/311658 P/N: 5551277	23-Sep-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/239156 P/N: 5512235	6-May-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/616997 P/N: 5773140	14-Mar-96		
60SD721 [Filed]	WIRE DRAWING DIE HAVING IMPROVED PHYSICAL PROPERTIES NO DIVISIONAL DUE PER GLL	United States	US	S/N: 08/412050 P/N: 5660075	28-Mar-95		
60SD726 [Filed]	A FINE GRAIN DIAMOND TOOL AND METHOD OF MANUFACTURE	United States	US	S/N: 08/551593 P/N: 5660936	1-Nov-95		
60SD728 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD731 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD732 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD745 [Filed]	METHOD FOR PRODUCING UNIFORMLY HIGH QUALITY ABRASIVE COMPACTS	United States	US	S/N: 08/555672 P/N: 5669944	13-Nov-95		
60SD749 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH REDUCED FAILURE DURING BRAZING	United States	US	S/N: 08/975028 P/N: 6042463	20-Nov-97		
60SD750 [Filed]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT NO DIV DUE PER EPA 5/1/97	United States	US	S/N: 08/591879 P/N: 5662720	26-Jan-96		
60SD752 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT (PDC) CUTTER WITH IMPROVED CUTTING CAPABILITY	United States	US	S/N: 08/975429 P/N: 6045440	20-Nov-97		
60SD753 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH IMPROVED CUTTING BY PREVENTING CHIP BUILD UP	United States	US	S/N: 09/131460 P/N: 6196910	10-Aug-98		
60SD760A [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT	United States	US	S/N: 08/777213 P/N: 5848657	27-Dec-96		
60SD768 [Filed]	AN IMPROVED ABRASIVE CUTTING ELEMENT AND DRILL BIT	United States	US	S/N: 08/611896 P/N: 5743346	6-Mar-96		
60SD769 [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT WITH DIAMOND RIDGE PATTERN	United States	US	S/N: 08/777222 P/N: 5829541	27-Dec-96		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 08/779417	7-Jan-97		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 10/411471	8-Apr-03		
60SD774 [Filed]	METHOD FOR PRODUCING CUBIC BORON NITRIDE USING MELAMINE AS A CATALYST	United States	US	S/N: 09/072144 P/N: 5869015	4-May-98		
60SD784 [Filed]	SYNTHETIC GASKET MATERIAL FOR USE IN HIGH PRESSURE PRESSES TRANS FM/MEGADIAMOND	United States	US	S/N: 08/874769 P/N: 5858525	13-Jun-97		

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60SD785 [Filed]	THERMALLY-DIFFUSED BORON DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/561128 P/N: 6322891	28-Apr-00		
60SD787 [Filed]	SUPERABRASIVE CUTTING ELEMENT WITH ENHANCED STIFFNESS, THERMAL CON DUCTIVITY AND CUTTING EFFICIENCY	United States	US	S/N: 08/783171 P/N: 6009963	14-Jan-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 08/950004 P/N: 5957005	14-Oct-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 09/358271 P/N: 6314836	21-Jul-99		
60SD794 [Filed]	AXISYMMETRIC CUTTING ELEMENT	United States	US	S/N: 09/492095 P/N: 6260640	27-Jan-00		
60SD795 [Filed]	SHAPED POLYCRYSTALLINE CUTTER ELEMENTS	United States	US	S/N: 09/072471 P/N: 6102143	4-May-98		
60SD796 [Filed]	TITANIUM CHROMIUM ALLOY COATED DIAMOND CRYSTALS FOR USE IN SAW BLA DE SEGMENTS AND METHOD FOR THEIR PRODUCTIO N	United States	US	S/N: 09/570957 P/N: 6319608	15-May-00		
60SD802 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORLESS AND FANCY COLORED DIAMONDS	United States	US	S/N: 10/338136	8-Jan-03		
60SD805 [Filed]	HIGH PRESSURE APPARATUS HAVING TRANSITION SLOPE BINDING RING THAT MITIGATES TENSILE STRESSES AND CORRESPONDI NG METHOD	United States	US	S/N: 09/740777 P/N: 6375446	19-Dec-00		
60SD806 [Filed]	LOW OXYGEN CUBIC BORON NITRIDE	United States	US	S/N: 10/001573	2-Nov-01		
60SD811 [Filed]	CRYSTAL MIXING FOR LOW POWER GRINDING	United States	US	S/N: 09/988244	16-Nov-01		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 60/139654	17-Jun-99		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 10/014547	14-Dec-01		
60SD817 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORED DIAMONDS	United States	US	S/N: 10/069362	25-Aug-00		
60SD820 [Filed]	SURFACE MODIFICATION OF COATED ABRASIVES TO ENHANCE THEIR ADHESION IN RESIN BOND TOOLS	United States	US	S/N: 09/901159	9-Jul-01		
60SD827 [Filed]	ABRASIVE TOOL INSERTS AND THEIR PRODUCTION	United States	US	S/N: 09/845540 P/N: 6315652	30-Apr-01		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 60/224485	11-Aug-00		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 10/344249	11-Feb-03		
60SD838 [Filed]	SILVER-COATED ABRASIVES, TOOLS CONTAINING SILVER-COATED ABRASIVES, AND APPLICATIONS OF THESE TOOLS	United States	US	S/N: 09/776141 P/N: 6666753	2-Feb-01		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/737667	15-Dec-00		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/799192	5-Mar-01		
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/935957	23-Aug-01		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 10/262784	2-Oct-02		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 09/987863 P/N: 6475254	16-Nov-01		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 10/174914 P/N: 6596040	19-Jun-02		
60SD852 [Filed]	HIGH PRESSURE PRODUCTION OF PEROVSKITES	United States	US	S/N: 09/931312	16-Aug-01		
RD14877 [Filed]	SINTERED POLYCRYSTALLINE DIAMOND COMPACT CONSTRUCTION WITH INTEGRA L HEAT SINK	United States	US	S/N: 652242 P/N: 4605343	20-Sep-84		
RD16334 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 830414 P/N: 4690691	13-Feb-86		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 07/332914 P/N: 5261959	4-Apr-89		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 08/150633 P/N: 5516554	10-Nov-93		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 48176 P/N: 4797138	11-May-87		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 07/048176 P/N: 4797138	11-May-87		
RD18116 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 07/744815 P/N: 5310447	12-Aug-91		
RD18402 [Filed]	EXCIMER LASER PATTERNING OF A NOVEL RESIST	United States	US	S/N: 224416 P/N: 4842677	26-Jul-88		
RD18693 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUB STRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/407179 P/N: 5110579	14-Sep-89		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD19567 [Filed]	FREE STANDING DIAMOND SHEET AND METHOD AND APPARATUS FOR MAKING SA ME	United States	US	S/N: 07/537963 P/N: 5464071	13-Jun-90		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/163608 P/N: 5419276	6-Dec-93		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/368732 P/N: 5540904	4-Jan-95		
RD20790 [Filed]	APPARATUS FOR PRODUCING DIAMONDS BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD20983 [Inactivated]	ARTIFICIAL POLYMER LATICES IN CORE-SHELL FORM AND METHOD OF PREPARATION	United States	US	S/N: 07/980,444 P/N: 5356955	23-Nov-93		
RD21018 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUBSTRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD21033 [Filed]	IMPROVED METHOD OF APPLYING METAL COATINGS ON DIAMOND AND ARTICLES MADE THEREFROM	United States	US	S/N: 07/722575 P/N: 5190796	27-Jun-91		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
RD21034 [Inactivated]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD21356 [Filed]	METHOD FOR PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION	United States	US	S/N: 07/845992 P/N: 5175929	4-Mar-92		
RD21493 [Filed]	METHOD OF APPLYING METAL COATING ON CUBIC ORON NITRIDE AND ARTICLE S MADE THEREFROM	United States	US	S/N: 07/738758 P/N: 5188643	1-Aug-91		
RD21661 [Filed]	PREHEATER FOR CVD DIAMOND REACTOR	United States	US	S/N: 08/306077 P/N: 5479874	14-Sep-94		
RD21796 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		
RD22021 [Filed]	SUBSTANTIALLY TRANSPARENT FREE STANDING DIAMOND FILMS	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD22055 [Filed]	METHOD FOR DETERMINING THICKNESS OF CHEMICAL VAPOR DEPOSITED LAYERS	United States	US	S/N: 07/991798 P/N: 5300313	16-Dec-92		
RD22294 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD22486 [Filed]	APPARATUS FOR PRODUCING DIAMOND BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD22514 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING GRAPHITE SUBSTRATE HOLDERS	United States	US	S/N: 08/096392 P/N: 5391229	26-Jul-93		
RD22530 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING THERM AL SPREADER	United States	US	S/N: 08/172797 P/N: 5397396	27-Dec-93		
RD22721 [Filed]	POLYCRYSTALLINE CARBON CONVERSION	United States	US	S/N: 09/206721 P/N: 6126741	7-Dec-98		
RD22800 [Filed]	TUNGSTEN METALIZATION OF CVD DIAMOND	United States	US	S/N: 08/100406 P/N: 5346719	2-Aug-93		
RD22976 [Filed]	METHOD FOR MAKING HIGH THERMAL CONDUCTING DIAMOND	United States	US	S/N: 08/316995 P/N: 5445106	3-Oct-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD23162 [Filed]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD23356 [Filed]	CHEMICAL VAPOR DEPOSITION OF POLYCRYSTALLINE DIAMOND WITH OR IENTATION AND GROWTH FACETS	United States	US	S/N: 08/264268 P/N: 5437891	23-Jun-94		
RD23427 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD23481 [Filed]	DIAMOND OPTICAL PLATE BEAMSPLITTER	United States	US	S/N: 08/538656 P/N: 5706135	3-Oct-95		
RD23502 [Filed]	APPARATUS FOR ANNEALING DIAMOND WATER JET MIXING TUBES	United States	US	S/N: 08/267181 P/N: 5468934	15-Jun-94		
RD23503 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD23511 [Filed]	ARTICLES HAVING THERMAL CONDUCTORS OF GRAPHITE	United States	US	S/N: 08/262796 P/N: 5494753	20-Jun-94		
RD23716 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
RD23717 [Filed]	ULTRAFAST OPTICAL MODULATOR	United States	US	S/N: 08/605417 P/N: 5659415	22-Feb-96		
RD23819 [Filed]	FABRICATION OF BRAZABLE IN AIR TOOL INSERTS AND INSERTS FABRICATED THEREBY	United States	US	S/N: 08/350572 P/N: 5626909	7-Dec-94		
RD23927 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499238 P/N: 5634369	7-Jul-95		
RD23948 [Filed]	DIAMOND FILM STRUCTURE WITH HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/316998 P/N: 5525815	3-Oct-94		
RD24002 [Filed]	SYNTHETIC DIAMOND PRODUCT	United States	US	S/N: 08/411181 P/N: 5503104	27-Mar-95		
RD24111 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD24416 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499237 P/N: 5636545	7-Jul-95		
RD24447 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499502 P/N: 5634370	7-Jul-95		
RD24450 [Filed]	ELECTRONIC APPARATUS WITH COMPLIANT METAL CHIP-SUBSTRATE BONDING LAYER(S)	United States	US	S/N: 08/457551 P/N: 5567985	1-Jun-95		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/201384 P/N: 6152977	30-Nov-98		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/484389 P/N: 6350191	14-Jan-00		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING S AME	United States	US	S/N: 09/484392 P/N: 6406776	14-Jan-00		
RD25308 [Filed]	SURFACE ENRICHED DIAMOND AND METHOD OF MAKING	United States	US	S/N: 09/783441	14-Feb-01		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/472104 P/N: 6258721	27-Dec-99		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/591189 P/N: 6242351	9-Jun-00		
RD27642 [Filed]	METHOD OF DETECTION OF NATURAL DIAMONDS THAT HAVE BEEN PROCESSED A T HIGH PRESSURE AND HIGH TEMPERATURES	United States	US	S/N: 09/430477 P/N: 6377340	29-Oct-99		
RD27888 [Filed]	FUNCTIONALIZED DIAMONDS WITH ENHANCED RETENTION IN RESIN BONDS, REACTIONS AND METHODS FOR PRODUCING SAME, AND ABRASIVES USING FUNCTIONALIZED DIAMONDS	United States	US	S/N: 09/576794 P/N: 6372002	23-May-00		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 09/793312 P/N: 6541115	26-Feb-01		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 10/255431	26-Sep-02		
RD28271 [Filed]	ABRASIVE DIAMOND COMPOSITE AND METHOD OF MAKING THEREOF	United States	US	S/N: 09/729525	4-Dec-00		
134047 [Filed]	METHOD TO STABILIZE FRAME SAW BLADES DURING CUT INITIATION	United States	US	134047 -1 Provisional [Filed] S/N 60/495,148	14-Aug-03		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH DISCRETE PARTICLE SIZE AREAS	United States	US	[Issued] S/N: 09/167,196 P/N: 6,187,068	[Awaiting] 10/6/98		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT AND THERMAL STABILITY	United States	US	[Issued] S/N: 08/523,868 P/N: 5,645,617	[Awaiting] 9/6/95		
[Awaiting]	COMPOSITE POLYCRYSTALLINE COMPACT WITH IMPROVED FRACTURE AND DELAMINATION RESISTANCE	United States	US	[Issued] S/N: 08/415,693 P/N: 5,564,511	[Awaiting] 5/15/95		
[Awaiting]	HIGH PRESSURE/HIGH TEMPERATURE PISTON-CYLINDER APPARATUS	United States	US	[Issued] S/N: 07/792,716 P/N: 5,244,368	[Awaiting] 11/15/91		
[Awaiting]	HIGH PRESSURE REACTION VESSEL	United States	US	[Issued] S/N: 07/826,809 P/N: 5,236,674	[Awaiting] 1/28/92		
[Awaiting]	MODIFIED END ASSEMBLY FOR HIGH PRESSURE, HIGH TEMPERATURE REACTION VESSELS	United States	US	[Issued] S/N: 07/660,332 P/N: 5,190,734	[Awaiting] 2/22/91		
[Awaiting]	HIGH STRENGTH COMPOSITE COMPONENT AND METHOD OF FABRICATION	United States	US	[Issued] S/N: 07/153,725 P/N: 5,032,147	[Awaiting] 2/8/88		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT RESISTANCE	United States	US	[Issued] S/N: 07/390,208 P/N: 5,011,515	[Awaiting] 8/7/89		
[Awaiting]	COMPOSITE COMPACT WITH A MORE THERMALLY STABLE CUTTING EDGE AND METHOD OF MANUFACTURING THE SAME	United States	US	[Issued] S/N: 07/390,204 P/N: 5,011,509	[Awaiting] 8/7/89		
[Awaiting]	COMPOSITE ABRASIVE COMPACT HAVING HIGH THERMAL STABILITY AND TRANSVERSE RUPTURE STRENGTH	United States	US	[Issued] S/N: 07/151,942 P/N: 4,871,377	[Awaiting] 2/3/88		
[Awaiting]	MATRIX CUTTER	United States	US	[Filed] S/N: 10/183,098	[Awaiting]		
[Awaiting]	ENHANCED METHOD FOR MAKING CVD DIAMOND	United States	US	[Filed] S/N: 10/161,266	[Awaiting] 6/3/02		

ASSIGNMENT PATENTS
GE SUPERABRASIVES, INC. TO
DIAMOND INNOVATIONS, INC.

This Assignment, effective the 31st day of Dec., 2003, is by and between GE SUPERABRASIVES, INC., a Corporation, having its principal corporate business address at 187 Danbury Road, Second Floor, Wilton, Connecticut, 06897 ("Assignor"), and DIAMOND INNOVATIONS, INC., a Delaware Corporation, having its principal corporate business address at 6325 Huntley Road, Worthington, Ohio, 46085 ("Assignee") (and collectively, "the Parties").

WHEREAS, Assignor and Assignee are parties to a certain Purchase Agreement dated as of September 24, 2003 (the "Purchase Agreement"), pursuant to which Assignee has agreed to purchase certain assets of Assignor, and Assignor has agreed to cause the same to be transferred, assigned and contributed to Assignee;

WHEREAS, Assignor is the sole owner of all right, title and interest in and to the pending patent applications identified in Appendix A and issued patents identified in Appendix B attached hereto, including all inventions referenced therein and letters patent issued thereon and applications for letters patent applied for with respect thereto, throughout the world, and all reissues, divisions, continuations, continuations-in-part, renewals, extensions, subsitutions, and re-examinations of any of the foregoing throughout the world ("Patents");

WHEREAS, pursuant to the Purchase Agreement, Assignor desires to assign and transfer to Assignee all of its right, title and interest in and to the Patents, and Assignee desires to acquire the same;

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

Without limiting the foregoing, the Assignor hereby sells, assigns and transfers to Assignee, its successors, assigns and legal representatives, all right, title and interest in and to the Patents, together with all rights to sue for past infringement of said Patents and all causes of action (either at law or equity) with respect thereto, the right of recovery, including but not limited to damages, for such past infringement, and the right to assign the rights conveyed herein, the same to be held and enjoyed by Assignee for its own use and benefit and for the use

and benefit of its successors, assigns and legal representatives. Assignor hereby authorizes the Assignee to record ownership of the Patents directly in Assignee's own name in any jurisdiction, municipality or agency, in which recordation is required.

IN WITNESS HEREOF, the parties hereto have duly executed this Agreement as of the Effective Date.

Signed at New York, NY on this 31st day of December, 2003.

GE SUPERABRASIVES, INC.
Assignor

By: _____

Name: William C. Carstanjen

Title: Vice President, Secretary

AGREED AND ACCEPTED:

Signed at Worthington, Ohio on this 8th day of February, 2004.

DIAMOND INNOVATIONS, INC.

By: _____

Name: TANYA D. FRATTO

Title: President & CEO

STATE OF New York)
)
COUNTY OF New York) ss:

BEFORE ME, the undersigned authority, on this day personally appeared William C. Carstanjen, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledges to me that he executed same for the purposes and consideration therein expressed in the capacity therein stated and as an act and deed of said corporation.

Given under my hand and seal of Office this 31st day of December, 2003.

Molly B Chase
Notary Public

My Commission Expires: 5/27/07

MOLLY B. CHASE
Notary Public, State of New York
No. 01CH6092796
Qualified in Queens County
Commission Expires 05/27/20 07

STATE OF)
)
COUNTY OF) ss:

BEFORE ME, the undersigned authority, on this day personally appeared Tanya D. Fratto, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledges to me that he executed same for the purposes and consideration therein expressed in the capacity therein stated and as an act and deed of such corporation.

Given under my hand and seal of Office this 9 day of Feb, 2004.

Karen Preest
Notary Public

My Commission Expires:

NOTARIAL SEAL
STATE OF OHIO

KAREN PREEST
Notary Public, State of Ohio
My Commission Expires 09-09-08

APPENDIX A

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
112200 [Filed]	POLYCRYSTALLINE DIAMOND TIPS ON CUTTERS FOR HIGH SPEED DISC SAWHEADS FOR APPLICATION IN THE TIMBER INDUSTRY	United States	US	Provisional [Filed] S/N: 60/473511	23-May-03		
123571 [Filed]	AUTOCATALYTIC NICKEL-BORON COATING PROCESS FOR DIAMOND PARTICLES	United States	US	Provisional [Filed] S/N: 60/438957	9-Jan-03		
123989 [Filed]	LASER SUPPORT NICKEL-PLATING OF SUPERABRASIVE TOOL	United States	US	S/N: 10/172,034	14-Jun-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	Provisional [Filed] S/N: 60/395,182	10-Jul-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	S/N: 10/458903 P/N: 6666753	11-Jun-03		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	Provisional [Filed] S/N: 60/395,181	10-Jul-02		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	S/N: 10/455008	5-Jun-03		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	Provisional [Filed] S/N: 60/432222	10-Dec-02		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	S/N 10/731,066	9-Dec-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	Provisional [Filed] S/N: 60/382209	21-May-02		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	S/N: 10/437469	8-Jul-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	125877 -7 Original [Filed]			
126337 [Filed]	SCRATCH-PROOF COMPOSITE WATCH GLASS	United States	US	Provisional [Filed] S/N: 60/399778	31-Jul-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	Provisional [Filed] S/N: 60/391707	26-Jun-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	S/N: 10/437516	14-May-03		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	Provisional [Filed] S/N: 60/414987	1-Oct-02		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	S/N 10/621,710	17-Jul-03		
129177 [Filed]	EXTRUSION AND COMPOUNDING EQUIPMENT COMPONENTS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445631	7-Feb-03		
129178 [Filed]	IMPROVED WEAR RESISTANT COMPONENTS FOR SIZE REDUCTION AND SIZE CLASSIFICATION EQUIPMENT	United States	US	Provisional [Filed] S/N: 60/445615	7-Feb-03		

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129182 [Filed]	WEAR CONTROL IN CONTINUOUS GLASS FIBER PLANTS	United States	US	Provisional [Filed] S/N: 60/445614	7-Feb-03		
129184 [Filed]	WEAR-RESISTANT DRILL BIT BODIES AND OTHER COMPONENTS FOR OIL AND GAS DRILLING	United States	US	Provisional [Filed] S/N: 60/445659	7-Feb-03		
129892 [Filed]	WEAR AND CORROSION RESISTANT ORIFICE AND RELATED COMPONENTS	United States	US	Provisional [Filed] S/N: 60/445633	7-Feb-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/440455	15-Jan-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/464517	22-Apr-03		
131068 [Filed]	WEAR AND CORROSION PREVENTION IN FIREARMS	United States	US	Provisional [Filed] S/N: 60/445609	7-Feb-03		
132255 [Filed]	AIRCRAFT ENGINE WEAR PARTS	United States	US	Provisional [Filed] S/N: 60/445632	7-Feb-03		
132270 [Filed]	CLIPPER BLADE SETS AND COMBS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445610	7-Feb-03		
132876 [Filed]	SELECTION OF DIAMONDS GRIT MORPHOLOGY AND SIZE DISTRIBUTION FOR CMP CONDITIONER APPLICATION	United States	US	Provisional [Filed] 60/509,625	8-Oct-03		
133139 [Filed]	IMPROVED WEAR PEROFRMANCE TOOLS FOR METAL, PLASTIC, CERAMIC AND COMPOSITE FORMING	United States	US	Provisional [Filed] S/N: 60/447808	14-Feb-03		
133140 [Filed]	PCD AND PCBN TOOL BLANKS WITH PREFIXED BRAZE ALLOY	United States	US	Provisional [Filed] S/N: 60/445613	7-Feb-03		
133141 [Filed]	COATINGS WITH HIGHLY TORTUOUS SURFACE TOPOGRAPHY FOR ABRASIVE/SUPERABRASIVE PARTICLES USED IN METALS/CERAMIC/POLYMER MATRIX COMPOSITES	United States	US	Provisional [Filed] S/N: 60/469285	8-May-03		
133615 [Filed]	IMPROVED TOOLS FOR MACHINING FIBER CEMENTS	United States	US	Provisional [Filed] 60/453,487	11-Mar-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	Provisional [Filed] S/N: 60/470306	14-May-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	S/N 10/690,761	22-Oct-03		
133920 [Filed]	DRILL BITS, ROUTER BITS, PROFILE CUTTERS, FILES, PLANING AND SAW BLADES WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/469287	9-May-03		
133975 [Filed]	METHOD TO IMPROVE TOOL INTEGRITY WHEN CUTTING STONE	United States	US	Provisional [Filed] S/N 60/495,148	14-Aug-03		
135143 [Filed]	A METHOD OF MAKING ABRASIVE TOOLS FROM BI-MODAL DIAMOND OR CUBIC BORON NITRIDE POWDER	United States	US	Provisional [Filed] S/N: 60/467311	2-May-03		

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136255 [Filed]	SINTERED COMPACT FOR USE IN MACHINING VARIOUS CAST IRON MATERIALS	United States	US	Provisional [Filed] S/N 60/526,576	3-Dec-03		
145361 [Filed]	COMPRESSION CONTAINER FOR POLYCRYSTALLINE WIRE DIE	United States	US	Provisional [Filed] S/N 60/528,372	10-Dec-03		
60SD10 [Filed]	DIAMOND AND CBN ABRASIVE COMPACTS USING SIZE SELECTIVE ABRASIVE PA RTICLE LAYERS	United States	US	S/N: 219289 P/N: 4311490	7-Sep-88		
60SD147 [Filed]	RE-SINTERED BORON-RICH POLYCRYSTALLINE CUBIC BORON NITRIDE AND MET HOD FOR MAKING SAME	United States	US	S/N: 823893 P/N: 4673414	29-Jan-86		
60SD184 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD240 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 542081 P/N: 4525179	14-Oct-83		
60SD242 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD245 [Filed]	MERGED WITH 60-SD-259 FOR FILING	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD24559 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD246 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD249 [Filed]	SWEEP THROUGH PROCESS FOR MAKING POLYCRYSTALLINE COMPACTS	United States	US	S/N: 536221 P/N: 4518659	23-Sep-83		
60SD251 [Filed]	IMPROVED PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 552081 P/N: 4525179	14-Oct-83		
60SD254 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 06/920041 P/N: 4738689	16-Oct-86		
60SD256 [Filed]	POLYCRYSTALLINE SANDWICH COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/277875 P/N: 5009673	30-Nov-88		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 697668 P/N: 4810447	4-Feb-85		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 8491 P/N: 4832708	27-Jan-87		
60SD261 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 7/366943 P/N: 5043120	16-Jun-89		
60SD262 [Filed]	BRAZED COMPOSITE COMPACT IMPLEMENTS	United States	US	S/N: 624064 P/N: 4527998	25-Jun-84		
60SD303 [Filed]	REFRACTORY METAL OXIDE COATED ABRASIVES AND GRINDING WHEELS MADE THEREFROM	United States	US	S/N: 07/358728 P/N: 4951427	30-May-89		
60SD305 [Filed]	STUD-MOUNTED POLYCRYSTALLINE TOOTHED DIAMOND CUTTING BLANKS	United States	US	S/N: 7/192872 P/N: D317010	11-May-88		
60SD308 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 7/365268 P/N: 4931363	12-Jun-89		

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60SD30811 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 158575 P/N: 4899922	22-Feb-88		
60SD317 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 920041 P/N: 47386689	16-Oct-86		
60SD318 [Filed]	BONDING OF THERMALLY STABLE ABRASIVE COMPACTS TO CARBIDE SUPPORTS	United States	US	S/N: 07/158336 P/N: 4850523	22-Feb-88		
60SD327 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 008491 P/N: 4832708	29-Jan-87		
60SD33 [Filed]	OPTICAL WINDOWS MADE OF POLYCRYSTALLINE ADAMANTANE BORON NITRIDE OR DIAMOND	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD332 [Filed]	METHOD OF MAKING DIAMOND TOOL	United States	US	S/N: 713966 P/N: 4661180	25-Mar-85		
60SD333 [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 153466 P/N: 4828582	3-Feb-88		
60SD333V [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 793462 P/N: 4828582	1-Sep-88		
60SD358 [Filed]	PRODUCTS AND PROCESS FOR MAKING MULTIGRAIN ABRASIVE COMPACTS	United States	US	S/N: 07/669259 P/N: 5211726	14-Mar-91		
60SD364 [Filed]	MULTIGRAIN ABRASIVE PARTICLES	United States	US	S/N: 07/669124 P/N: 5106392	14-Mar-91		
60SD367 [Filed]	CHIP BREAKER FOR POLYCRYSTALLINE CBN AND DIAMOND COMPACTS	United States	US	S/N: 7/429661 P/N: 5026960	31-Oct-89		
60SD368 [Filed]	DIAMOND AND CUBIC BORON NITRIDE	United States	US	S/N: 156272 P/N: 4807402	12-Feb-88		
60SD389 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANKS	United States	US	S/N: 328347 P/N: D330206	24-Mar-89		
60SD390 [Filed]	RECIPROCATING POINT ROTARY DIAMOND	United States	US	S/N: 07/635082 P/N: 5172681	28-Dec-90		
60SD401 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332814 P/N: D325226	3-Apr-89		
60SD412 [Filed]	SAWBLADE SEGMENTS UTILIZING POLYCRYSTALLINE DIAMOND GRIT	United States	US	S/N: 262405 P/N: 4883500	25-Oct-88		
60SD419 [Filed]	SUPPORTED THERMALLY STABLE CUBIC BORON NITRIDE TOOLS BLANKS AND METHOD FOR MAKING THE SAME	United States	US	S/N: 7/394349 P/N: 4985050	15-Aug-89		
60SD428 [Filed]	DIAMOND COMPACTS FOR ROCK DRILLING AND MACHINING	United States	US	S/N: 7/420191 P/N: 5022894	12-Oct-89		
60SD437 [Filed]	METHOD FOR PRODUCING POLYCRYSTALLINE COMPACT TOOL BLANKS WITH FLAT CARBIDE SUPPORT/DIAMOND OR CBN INTERFACES	United States	US	S/N: 331928 P/N: 4954139	31-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 328348 P/N: D324527	24-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 7/328348 P/N: 324527	24-Mar-89		
60SD440 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332828 P/N: D324056	3-Apr-89		
60SD455 [Filed]	CBN/CBN COMPOSITE MASSES AND THEIR PREPARATION	United States	US	S/N: 7/630916 P/N: 5106792	20-Dec-90		
60SD458 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES FOR SINTERED METAL BONDED TOOLS	United States	US	S/N: 07/857132 P/N: 5250086	25-Mar-92		

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60SD461 [Filed]	BRAZED THERMALLY-STABLE POLYCRSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 365268 P/N: 4931363	12-Jun-89		
60SD469 [Filed]	POLYCRYSTALLINE CVD DIAMOND SUBSTRATE FOR SINGLE CRYSTAL EPITAXIAL GROWTH OF SEMICONDUCTORS FORMERLY	United States	US	S/N: 07/479486 P/N: 4981818	13-Feb-90		
60SD493 [Filed]	CVD DIAMOND COATED ANNULUS COMPONENTS AND THEIR METHOD OF FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/563367 P/N: 5096736	7-Aug-90		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/929239 P/N: 5256206	14-Aug-92		
60SD499 [Filed]	CVD DIAMOND COATED TWIST DRILLS	United States	US	S/N: 07/555879 P/N: 5022801	18-Jul-90		
60SD504 [Filed]	USING THERMALLY-STABLE DIAMOND OR CBN COMPACTS AS TIPS FOR ROTARY DRILLS	United States	US	S/N: 07/577379 P/N: 5273557	4-Sep-90		
60SD506 [Filed]	ISOTOPICALLY PURE SINGLE CRYSTAL EPITAXIAL DIAMOND FILMS AND THEIR PREPARATION	United States	US	S/N: 07/547651 P/N: 5360479	2-Jul-90		
60SD518 [Filed]	THERMALLY STABLE DENSE ELECTRICALLY CONDUCTIVE DIAMOND COMPACTS	United States	US	S/N: 07/773461 P/N: 5266236	9-Oct-91		
60SD528 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD567 [Filed]	CHEMICALLY BONDED ADHERENT COATING FOR ABRASIVE COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/710725 P/N: 5173091	4-Jun-91		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 08/220946 P/N: 5523121	31-Mar-94		
60SD577 [Filed]	CARBON FLUORIDE COMPOSITIONS	United States	US	S/N: 08/073991 P/N: 5380557	3-Jun-93		
60SD578 [Filed]	METHOD FOR MAKING SMOOTH SUBSTRATE MANDRELS	United States	US	S/N: 07/815478 P/N: 5176803	4-Mar-92		
60SD581 [Filed]	METHOD FOR PRODUCING UNIFORM CYLINDRICAL TUBES OF CVD DIAMOND	United States	US	S/N: 08/138888 P/N: 5387447	19-Oct-93		
60SD582 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD583 [Filed]	COATING FOR IMPROVED RETENTION OF CBN IN VITREOUS BOND MATRICES	United States	US	S/N: 08/005951 P/N: 5300129	19-Jan-93		
60SD584 [Filed]	DUAL-COATED DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/762999 P/N: 5143523	20-Sep-91		
60SD615 [Filed]	METHOD FOR CONTROLLING THE PARTICLE SIZE DISTRIBUTION IN THE PRODU CTION OF MULTICRYSTALLINE CUBIC BORON NITR IDE	United States	US	S/N: 07/995229 P/N: 5985228	22-Dec-92		
60SD628 [Filed]	DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/857192 P/N: 5405573	4-May-92		
60SD633 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES WITH AN ELECTROLESSLY DEPOSITED METAL LAYER	United States	US	S/N: 07/857139 P/N: 5232469	25-Mar-92		

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60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/322841 P/N: 5510193	13-Oct-94		
60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/595715 P/N: 5603070	2-Feb-96		
60SD645 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD647 [Filed]	FINE GRAIN DIAMOND WORKPIECES	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/095631 P/N: 5484330	21-Jul-93		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD653 [Filed]	REDUCTION OF STRESSES IN THE POLYCRYSTALLINE ABRASIVE LAYER OF A C OMPOSITE COMPACT IN THE IN SITU BONDED CAR BIDE/CARBIDE SUPPORT	United States	US	S/N: 08/489877 P/N: 5560754	13-Jun-95		
60SD658 [Filed]	ABRASIVE TOOL INSERT SEE CIP	United States	US	S/N: 08/105523 P/N: 5494477	11-Aug-93		
60SD660 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 07/985500 P/N: 5320988	1-Dec-92		
60SD662 [Filed]	METHOD OF SEPARATION OF PIECES FROM SUPER HARD MATERIAL BY PARTIAL LASER CUT AND PRESSURE CLEAVAGE	United States	US	S/N: 08/060459 P/N: 5387776	11-May-93		
60SD664 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD665 [Filed]	MEASURING THE STRENGTH OF ABRASIVE GRAINS	United States	US	S/N: 08/016638 P/N: 5392633	12-Feb-93		
60SD669 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD690 [Filed]	MULTIPLE GRAINED DIAMOND WIRE DIE	United States	US	S/N: 08/143802 P/N: 5361621	27-Oct-93		
60SD691 [Filed]	OPTICALLY IMPROVED DIAMOND WIRE DIE	United States	US	S/N: 08/148803 P/N: 5465603	5-Nov-93		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 08/571312 P/N: 5855996	12-Dec-95		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 09/087776 P/N: 6132675	29-May-98		
60SD694 [Filed]	DIAMOND WIRE DIE	United States	US	S/N: 08/121014 P/N: 5363687	14-Sep-93		
60SD696 [Filed]	ABRASIVE TOOL INSERT	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD698 [Filed]	CVD DIAMOND COATING ANNULUS COMPONENTS AND METHOD OF THEIR FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD701 [Filed]	DIAMOND WIRE DIE WITH POSITIONED OPENING	United States	US	S/N: 08/144168 P/N: 5377522	27-Oct-93		
60SD708 [Filed]	A METHOD FOR MANUFACTURING A DIAMOND ARTICLE	United States	US	S/N: 08/310449 P/N: 5529805	22-Sep-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/286076 P/N: 5500248	4-Aug-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/583360 P/N: 5647878	5-Jan-96		

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60SD712 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/238543 P/N: 5451430	5-May-94		
60SD713 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/654815 P/N: 5672395	29-May-96		
60SD714 [Filed]	ANNULAR DIAMOND BODIES	United States	US	S/N: 08/311658 P/N: 5551277	23-Sep-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/239156 P/N: 5512235	6-May-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/616997 P/N: 5773140	14-Mar-96		
60SD721 [Filed]	WIRE DRAWING DIE HAVING IMPROVED PHYSICAL PROPERTIES NO DIVISIONAL DUE PER GLL	United States	US	S/N: 08/412050 P/N: 5660075	28-Mar-95		
60SD726 [Filed]	A FINE GRAIN DIAMOND TOOL AND METHOD OF MANUFACTURE	United States	US	S/N: 08/551593 P/N: 5660936	1-Nov-95		
60SD728 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD731 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD732 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD745 [Filed]	METHOD FOR PRODUCING UNIFORMLY HIGH QUALITY ABRASIVE COMPACTS	United States	US	S/N: 08/555672 P/N: 5669944	13-Nov-95		
60SD749 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH REDUCED FAILURE DURING BRAZING	United States	US	S/N: 08/975028 P/N: 6042463	20-Nov-97		
60SD750 [Filed]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT NO DIV DUE PER EPA 5/1/97	United States	US	S/N: 08/591879 P/N: 5662720	26-Jan-96		
60SD752 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT (PDC) CUTTER WITH IMPROVED CUTTING CAPABILITY	United States	US	S/N: 08/975429 P/N: 6045440	20-Nov-97		
60SD753 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH IMPROVED CUTTING BY PREVENTING CHIP BUILD UP	United States	US	S/N: 09/131460 P/N: 6196910	10-Aug-98		
60SD760A [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT	United States	US	S/N: 08/777213 P/N: 5848657	27-Dec-96		
60SD768 [Filed]	AN IMPROVED ABRASIVE CUTTING ELEMENT AND DRILL BIT	United States	US	S/N: 08/611896 P/N: 5743346	6-Mar-96		
60SD769 [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT WITH DIAMOND RIDGE PATTERN	United States	US	S/N: 08/777222 P/N: 5829541	27-Dec-96		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 08/779417	7-Jan-97		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 10/411471	8-Apr-03		
60SD774 [Filed]	METHOD FOR PRODUCING CUBIC BORON NITRIDE USING MELAMINE AS A CATALYST	United States	US	S/N: 09/072144 P/N: 5869015	4-May-98		
60SD784 [Filed]	SYNTHETIC GASKET MATERIAL FOR USE IN HIGH PRESSURE PRESSES TRANS FM/MEGADIAMOND	United States	US	S/N: 08/874769 P/N: 5858525	13-Jun-97		

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60SD785 [Filed]	THERMALLY-DIFFUSED BORON DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/561128 P/N: 6322891	28-Apr-00		
60SD787 [Filed]	SUPERABRASIVE CUTTING ELEMENT WITH ENHANCED STIFFNESS, THERMAL CON DUCTIVITY AND CUTTING EFFICIENCY	United States	US	S/N: 08/783171 P/N: 6009963	14-Jan-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 08/950004 P/N: 5957005	14-Oct-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 09/358271 P/N: 6314836	21-Jul-99		
60SD794 [Filed]	AXISYMMETRIC CUTTING ELEMENT	United States	US	S/N: 09/492095 P/N: 6260640	27-Jan-00		
60SD795 [Filed]	SHAPED POLYCRYSTALLINE CUTTER ELEMENTS	United States	US	S/N: 09/072471 P/N: 6102143	4-May-98		
60SD796 [Filed]	TITANIUM CHROMIUM ALLOY COATED DIAMOND CRYSTALS FOR USE IN SAW BLA DE SEGMENTS AND METHOD FOR THEIR PRODUCTIO N	United States	US	S/N: 09/570957 P/N: 6319608	15-May-00		
60SD802 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORLESS AND FANCY COLORED DIAMONDS	United States	US	S/N: 10/338136	8-Jan-03		
60SD805 [Filed]	HIGH PRESSURE APPARATUS HAVING TRANSITION SLOPE BINDING RING THAT MITIGATES TENSILE STRESSES AND CORRESPONDI NG METHOD	United States	US	S/N: 09/740777 P/N: 6375446	19-Dec-00		
60SD806 [Filed]	LOW OXYGEN CUBIC BORON NITRIDE	United States	US	S/N: 10/001573	2-Nov-01		
60SD811 [Filed]	CRYSTAL MIXING FOR LOW POWER GRINDING	United States	US	S/N: 09/988244	16-Nov-01		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 60/139654	17-Jun-99		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 10/014547	14-Dec-01		
60SD817 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORED DIAMONDS	United States	US	S/N: 10/069362	25-Aug-00		
60SD820 [Filed]	SURFACE MODIFICATION OF COATED ABRASIVES TO ENHANCE THEIR ADHESION IN RESIN BOND TOOLS	United States	US	S/N: 09/901159	9-Jul-01		
60SD827 [Filed]	ABRASIVE TOOL INSERTS AND THEIR PRODUCTION	United States	US	S/N: 09/845540 P/N: 6315652	30-Apr-01		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 60/224485	11-Aug-00		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 10/344249	11-Feb-03		
60SD838 [Filed]	SILVER-COATED ABRASIVES, TOOLS CONTAINING SILVER-COATED ABRASIVES, AND APPLICATIONS OF THESE TOOLS	United States	US	S/N: 09/776141 P/N: 6666753	2-Feb-01		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/737667	15-Dec-00		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/799192	5-Mar-01		
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/935957	23-Aug-01		

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60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 10/262784	2-Oct-02		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 09/987863 P/N: 6475254	16-Nov-01		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 10/174914 P/N: 6596040	19-Jun-02		
60SD852 [Filed]	HIGH PRESSURE PRODUCTION OF PEROVSKITES	United States	US	S/N: 09/931312	16-Aug-01		
RD14877 [Filed]	SINTERED POLYCRYSTALLINE DIAMOND COMPACT CONSTRUCTION WITH INTEGRA L HEAT SINK	United States	US	S/N: 652242 P/N: 4605343	20-Sep-84		
RD16334 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 830414 P/N: 4690691	13-Feb-86		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 07/332914 P/N: 5261959	4-Apr-89		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 08/150633 P/N: 5516554	10-Nov-93		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 48176 P/N: 4797138	11-May-87		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 07/048176 P/N: 4797138	11-May-87		
RD18116 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 07/744815 P/N: 5310447	12-Aug-91		
RD18402 [Filed]	EXCIMER LASER PATTERNING OF A NOVEL RESIST	United States	US	S/N: 224416 P/N: 4842677	26-Jul-88		
RD18693 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUB STRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/407179 P/N: 5110579	14-Sep-89		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD19567 [Filed]	FREE STANDING DIAMOND SHEET AND METHOD AND APPARATUS FOR MAKING SA ME	United States	US	S/N: 07/537963 P/N: 5464071	13-Jun-90		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/163608 P/N: 5419276	6-Dec-93		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/368732 P/N: 5540904	4-Jan-95		
RD20790 [Filed]	APPARATUS FOR PRODUCING DIAMONDS BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD20983 [Inactivated]	ARTIFICIAL POLYMER LATICES IN CORE-SHELL FORM AND METHOD OF PREPARATION	United States	US	S/N: 07/980,444 P/N: 5356955	23-Nov-93		
RD21018 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUBSTRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD21033 [Filed]	IMPROVED METHOD OF APPLYING METAL COATINGS ON DIAMOND AND ARTICLES MADE THEREFROM	United States	US	S/N: 07/722575 P/N: 5190796	27-Jun-91		

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RD21034 [Inactivated]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD21356 [Filed]	METHOD FOR PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION	United States	US	S/N: 07/845992 P/N: 5175929	4-Mar-92		
RD21493 [Filed]	METHOD OF APPLYING METAL COATING ON CUBIC ORON NITRIDE AND ARTICLE S MADE THEREFROM	United States	US	S/N: 07/738758 P/N: 5188643	1-Aug-91		
RD21661 [Filed]	PREHEATER FOR CVD DIAMOND REACTOR	United States	US	S/N: 08/306077 P/N: 5479874	14-Sep-94		
RD21796 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		
RD22021 [Filed]	SUBSTANTIALLY TRANSPARENT FREE STANDING DIAMOND FILMS	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD22055 [Filed]	METHOD FOR DETERMINING THICKNESS OF CHEMICAL VAPOR DEPOSITED LAYERS	United States	US	S/N: 07/991798 P/N: 5300313	16-Dec-92		
RD22294 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD22486 [Filed]	APPARATUS FOR PRODUCING DIAMOND BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD22514 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING GRAPHITE SUBSTRATE HOLDERS	United States	US	S/N: 08/096392 P/N: 5391229	26-Jul-93		
RD22530 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING THERM AL SPREADER	United States	US	S/N: 08/172797 P/N: 5397396	27-Dec-93		
RD22721 [Filed]	POLYCRYSTALLINE CARBON CONVERSION	United States	US	S/N: 09/206721 P/N: 6126741	7-Dec-98		
RD22800 [Filed]	TUNGSTEN METALIZATION OF CVD DIAMOND	United States	US	S/N: 08/100406 P/N: 5346719	2-Aug-93		
RD22976 [Filed]	METHOD FOR MAKING HIGH THERMAL CONDUCTING DIAMOND	United States	US	S/N: 08/316995 P/N: 5445106	3-Oct-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD23162 [Filed]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD23356 [Filed]	CHEMICAL VAPOR DEPOSITION OF POLYCRYSTALLINE DIAMOND WITH OR IENTATION AND GROWTH FACETS	United States	US	S/N: 08/264268 P/N: 5437891	23-Jun-94		
RD23427 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD23481 [Filed]	DIAMOND OPTICAL PLATE BEAMSPLITTER	United States	US	S/N: 08/538656 P/N: 5706135	3-Oct-95		
RD23502 [Filed]	APPARATUS FOR ANNEALING DIAMOND WATER JET MIXING TUBES	United States	US	S/N: 08/267181 P/N: 5468934	15-Jun-94		
RD23503 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD23511 [Filed]	ARTICLES HAVING THERMAL CONDUCTORS OF GRAPHITE	United States	US	S/N: 08/262796 P/N: 5494753	20-Jun-94		
RD23716 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		

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RD23717 [Filed]	ULTRAFAST OPTICAL MODULATOR	United States	US	S/N: 08/605417 P/N: 5659415	22-Feb-96		
RD23819 [Filed]	FABRICATION OF BRAZABLE IN AIR TOOL INSERTS AND INSERTS FABRICATED THEREBY	United States	US	S/N: 08/350572 P/N: 5626909	7-Dec-94		
RD23927 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499238 P/N: 5634369	7-Jul-95		
RD23948 [Filed]	DIAMOND FILM STRUCTURE WITH HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/316998 P/N: 5525815	3-Oct-94		
RD24002 [Filed]	SYNTHETIC DIAMOND PRODUCT	United States	US	S/N: 08/411181 P/N: 5503104	27-Mar-95		
RD24111 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD24416 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499237 P/N: 5636545	7-Jul-95		
RD24447 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499502 P/N: 5634370	7-Jul-95		
RD24450 [Filed]	ELECTRONIC APPARATUS WITH COMPLIANT METAL CHIP-SUBSTRATE BONDING LAYER(S)	United States	US	S/N: 08/457551 P/N: 5567985	1-Jun-95		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/201384 P/N: 6152977	30-Nov-98		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/484389 P/N: 6350191	14-Jan-00		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING S AME	United States	US	S/N: 09/484392 P/N: 6406776	14-Jan-00		
RD25308 [Filed]	SURFACE ENRICHED DIAMOND AND METHOD OF MAKING	United States	US	S/N: 09/783441	14-Feb-01		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/472104 P/N: 6258721	27-Dec-99		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/591189 P/N: 6242351	9-Jun-00		
RD27642 [Filed]	METHOD OF DETECTION OF NATURAL DIAMONDS THAT HAVE BEEN PROCESSED A T HIGH PRESSURE AND HIGH TEMPERATURES	United States	US	S/N: 09/430477 P/N: 6377340	29-Oct-99		
RD27888 [Filed]	FUNCTIONALIZED DIAMONDS WITH ENHANCED RETENTION IN RESIN BONDS, REACTIONS AND METHODS FOR PRODUCING SAME, AND ABRASIVES USING FUNCTIONALIZED DIAMONDS	United States	US	S/N: 09/576794 P/N: 6372002	23-May-00		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 09/793312 P/N: 6541115	26-Feb-01		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 10/255431	26-Sep-02		
RD28271 [Filed]	ABRASIVE DIAMOND COMPOSITE AND METHOD OF MAKING THEREOF	United States	US	S/N: 09/729525	4-Dec-00		
134047 [Filed]	METHOD TO STABILIZE FRAME SAW BLADES DURING CUT INITIATION	United States	US	134047 -1 Provisional [Filed]	14-Aug-03		

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[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH DISCRETE PARTICLE SIZE AREAS	United States	US	[Issued] S/N: 09/167,196 P/N: 6,187,068	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT AND THERMAL STABILITY	United States	US	[Issued] S/N: 08/523,868 P/N: 5,645,617	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE COMPACT WITH IMPROVED FRACTURE AND DELAMINATION RESISTANCE	United States	US	[Issued] S/N: 08/415,693 P/N: 5,564,511	[Awaiting]		
[Awaiting]	HIGH PRESSURE/HIGH TEMPERATURE PISTON-CYLINDER APPARATUS	United States	US	[Issued] S/N: 07/792,716 P/N: 5,244,368	[Awaiting]		
[Awaiting]	HIGH PRESSURE REACTION VESSEL	United States	US	[Issued] S/N: 07/826,809 P/N: 5,236,674	[Awaiting]		
[Awaiting]	MODIFIED END ASSEMBLY FOR HIGH PRESSURE, HIGH TEMPERATURE REACTION VESSELS	United States	US	[Issued] S/N: 07/660,332 P/N: 5,190,734	[Awaiting]		
[Awaiting]	HIGH STRENGTH COMPOSITE COMPONENT AND METHOD OF FABRICATION	United States	US	[Issued] S/N: 07/153,725 P/N: 5,032,147	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT RESISTANCE	United States	US	[Issued] S/N: 07/390,208 P/N: 5,011,515	[Awaiting]		
[Awaiting]	COMPOSITE COMPACT WITH A MORE THERMALLY STABLE CUTTING EDGE AND METHOD OF MANUFACTURING THE SAME	United States	US	[Issued] S/N: 07/390,204 P/N: 5,011,509	[Awaiting]		
[Awaiting]	COMPOSITE ABRASIVE COMPACT HAVING HIGH THERMAL STABILITY AND TRANSVERSE RUPTURE STRENGTH	United States	US	[Issued] S/N: 07/151,942 P/N: 4,871,377	[Awaiting]		
[Awaiting]	MATRIX CUTTER	United States	US	[Filed] S/N: 10/183,098	[Awaiting]		
[Awaiting]	ENHANCED METHOD FOR MAKING CVD DIAMOND	United States	US	[Filed] S/N: 10/161,266	[Awaiting]		

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112200 [Filed]	POLYCRYSTALLINE DIAMOND TIPS ON CUTTERS FOR HIGH SPEED DISC SAWHEADS FOR APPLICATION IN THE TIMBER INDUSTRY	United States	US	Provisional [Filed] S/N: 60/473511	23-May-03		
123571 [Filed]	AUTOCATALYTIC NICKEL-BORON COATING PROCESS FOR DIAMOND PARTICLES	United States	US	Provisional [Filed] S/N: 60/438957	9-Jan-03		
123989 [Filed]	LASER SUPPORT NICKEL-PLATING OF SUPERABRASIVE TOOL	United States	US	S/N: 10/172,034	14-Jun-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	Provisional [Filed] S/N: 60/395,182	10-Jul-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	S/N: 10/458903 **P/N: 6666753**	11-Jun-03		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	Provisional [Filed] S/N: 60/395,181	10-Jul-02		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	S/N: 10/455008	5-Jun-03		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	Provisional [Filed] S/N: 60/432222	10-Dec-02		
125185 [Filed]	**METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE**	**United States**	**US**		**9-Dec-03**		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	Provisional [Filed] S/N: 60/382209	21-May-02		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	S/N: 10/437469	8-Jul-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	125877 -7 Original [Filed]			
126337 [Filed]	SCRATCH-PROOF COMPOSITE WATCH GLASS	United States	US	Provisional [Filed] S/N: 60/399778	31-Jul-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	Provisional [Filed] S/N: 60/391707	26-Jun-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	S/N: 10/437516	14-May-03		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	Provisional [Filed] S/N: 60/414987	1-Oct-02		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US		17-Jul-03		
129177 [Filed]	EXTRUSION AND COMPOUNDING EQUIPMENT COMPONENTS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445631	7-Feb-03		
129178 [Filed]	IMPROVED WEAR RESISTANT COMPONENTS FOR SIZE REDUCTION AND SIZE CLASSIFICATION EQUIPMENT	United States	US	Provisional [Filed] S/N: 60/445615	7-Feb-03		

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129182 [Filed]	WEAR CONTROL IN CONTINUOUS GLASS FIBER PLANTS	United States	US	Provisional [Filed] S/N: 60/445614	7-Feb-03		
129184 [Filed]	WEAR-RESISTANT DRILL BIT BODIES AND OTHER COMPONENTS FOR OIL AND GAS DRILLING	United States	US	Provisional [Filed] S/N: 60/445659	7-Feb-03		
129892 [Filed]	WEAR AND CORROSION RESISTANT ORIFICE AND RELATED COMPONENTS	United States	US	Provisional [Filed] S/N: 60/445633	7-Feb-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/440455	15-Jan-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/464517	22-Apr-03		
131068 [Filed]	WEAR AND CORROSION PREVENTION IN FIREARMS	United States	US	Provisional [Filed] S/N: 60/445609	7-Feb-03		
132255 [Filed]	AIRCRAFT ENGINE WEAR PARTS	United States	US	Provisional [Filed] S/N: 60/445632	7-Feb-03		
132270 [Filed]	CLIPPER BLADE SETS AND COMBS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445610	7-Feb-03		
132875 [Filed]	SELECTION OF DIAMONDS GRIT MORPHOLOGY AND SIZE DISTRIBUTION FOR CMP CONDITIONER APPLICATION	United States	US	Provisional [Filed]	8-Oct-03		
133139 [Filed]	IMPROVED WEAR PEROFRMANCE TOOLS FOR METAL, PLASTIC, CERAMIC AND COMPOSITE FORMING	United States	US	Provisional [Filed] S/N: 60/447808	14-Feb-03		
133140 [Filed]	PCD AND PCBN TOOL BLANKS WITH PREFIXED BRAZE ALLOY	United States	US	Provisional [Filed] S/N: 60/445613	7-Feb-03		
133141 [Filed]	COATINGS WITH HIGHLY TORTUOUS SURFACE TOPOGRAPHY FOR ABRASIVE/SUPERABRASIVE PARTICLES USED IN METALS/CERAMIC/POLYMER MATRIX COMPOSITES	United States	US	Provisional [Filed] S/N: 60/469285	8-May-03		
133615 [Filed]	IMPROVED TOOLS FOR MACHINING FIBER CEMENTS	United States	US	Provisional [Filed]	11-Mar-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	Provisional [Filed] S/N: 60/470306	14-May-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US		22-Oct-03		
133920 [Filed]	DRILL BITS, ROUTER BITS, PROFILE CUTTERS, FILES, PLANING AND SAW BLADES WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/469287	9-May-03		
133975 [Filed]	METHOD TO IMPROVE TOOL INTEGRITY WHEN CUTTING STONE	United States	US	Provisional [Filed]	14-Aug-03		
135143 [Filed]	A METHOD OF MAKING ABRASIVE TOOLS FROM BI-MODAL DIAMOND OR CUBIC BORON NITRIDE POWDER	United States	US	Provisional [Filed] S/N: 60/467311	2-May-03		

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136255 [Filed]	SINTERED COMPACT FOR USE IN MACHINING VARIOUS CAST IRON MATERIALS	United States	US	Provisional [Filed]	3-Dec-03		
145361 [Filed]	COMPRESSION CONTAINER FOR POLYCRYSTALLINE WIRE DIE	United States	US	Provisional [Filed]	10-Dec-03		
60SD10 [Filed]	DIAMOND AND CBN ABRASIVE COMPACTS USING SIZE SELECTIVE ABRASIVE PA RTICLE LAYERS	United States	US	S/N: 219289 P/N: 4311490	7-Sep-88		
60SD147 [Filed]	RE-SINTERED BORON-RICH POLYCRYSTALLINE CUBIC BORON NITRIDE AND MET HOD FOR MAKING SAME	United States	US	S/N: 823893 P/N: 4673414	29-Jan-86		
60SD184 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD240 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 542081 P/N: 4525179	14-Oct-83		
60SD242 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD245 [Filed]	MERGED WITH 60-SD-259 FOR FILING	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD24559 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD246 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD249 [Filed]	SWEEP THROUGH PROCESS FOR MAKING POLYCRYSTALLINE COMPACTS	United States	US	S/N: 536221 P/N: 4518659	23-Sep-83		
60SD251 [Filed]	IMPROVED PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 552081 P/N: 4525179	14-Oct-83		
60SD254 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 06/920041 P/N: 4738689	16-Oct-86		
60SD256 [Filed]	POLYCRYSTALLINE SANDWICH COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/277875 P/N: 5009673	30-Nov-88		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 697668 P/N: 4810447	4-Feb-85		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 8491 P/N: 4832708	27-Jan-87		
60SD261 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 7/366943 P/N: 5043120	16-Jun-89		
60SD262 [Filed]	BRAZED COMPOSITE COMPACT IMPLEMENTS	United States	US	S/N: 624064 P/N: 4527998	25-Jun-84		
60SD303 [Filed]	REFRACTORY METAL OXIDE COATED ABRASIVES AND GRINDING WHEELS MADE THEREFROM	United States	US	S/N: 07/358728 P/N: 4951427	30-May-89		
60SD305 [Filed]	STUD-MOUNTED POLYCRYSTALLINE TOOTHED DIAMOND CUTTING BLANKS	United States	US	S/N: 7/192872 P/N: D317010	11-May-88		
60SD308 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 7/365268 P/N: 4931363	12-Jun-89		

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60SD30811 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 158575 P/N: 4899922	22-Feb-88		
60SD317 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 920041 P/N: 47386689	16-Oct-86		
60SD318 [Filed]	BONDING OF THERMALLY STABLE ABRASIVE COMPACTS TO CARBIDE SUPPORTS	United States	US	S/N: 07/158336 P/N: 4850523	22-Feb-88		
60SD327 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 008491 P/N: 4832708	29-Jan-87		
60SD33 [Filed]	OPTICAL WINDOWS MADE OF POLYCRYSTALLINE ADAMANTANE BORON NITRIDE OR DIAMOND	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD332 [Filed]	METHOD OF MAKING DIAMOND TOOL	United States	US	S/N: 713966 P/N: 4661180	25-Mar-85		
60SD333 [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 153466 P/N: 4828582	3-Feb-88		
60SD333V [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 793462 P/N: 4828582	1-Sep-88		
60SD358 [Filed]	PRODUCTS AND PROCESS FOR MAKING MULTIGRAIN ABRASIVE COMPACTS	United States	US	S/N: 07/669259 P/N: 5211726	14-Mar-91		
60SD364 [Filed]	MULTIGRAIN ABRASIVE PARTICLES	United States	US	S/N: 07/669124 P/N: 5106392	14-Mar-91		
60SD367 [Filed]	CHIP BREAKER FOR POLYCRYSTALLINE CBN AND DIAMOND COMPACTS	United States	US	S/N: 7/429661 P/N: 5026960	31-Oct-89		
60SD368 [Filed]	DIAMOND AND CUBIC BORON NITRIDE	United States	US	S/N: 156272 P/N: 4807402	12-Feb-88		
60SD389 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANKS	United States	US	S/N: 328347 P/N: D330206	24-Mar-89		
60SD390 [Filed]	RECIPROCATING POINT ROTARY DIAMOND	United States	US	S/N: 07/635082 P/N: 5172681	28-Dec-90		
60SD401 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332814 P/N: D325226	3-Apr-89		
60SD412 [Filed]	SAWBLADE SEGMENTS UTILIZING POLYCRYSTALLINE DIAMOND GRIT	United States	US	S/N: 262405 P/N: 4883500	25-Oct-88		
60SD419 [Filed]	SUPPORTED THERMALLY STABLE CUBIC BORON NITRIDE TOOLS BLANKS AND METHOD FOR MAKING THE SAME	United States	US	S/N: 7/394349 P/N: 4985050	15-Aug-89		
60SD428 [Filed]	DIAMOND COMPACTS FOR ROCK DRILLING AND MACHINING	United States	US	S/N: 7/420191 P/N: 5022894	12-Oct-89		
60SD437 [Filed]	METHOD FOR PRODUCING POLYCRYSTALLINE COMPACT TOOL BLANKS WITH FLAT CARBIDE SUPPORT/DIAMOND OR CBN INTERFACES	United States	US	S/N: 331928 P/N: 4954139	31-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 328348 P/N: D324527	24-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 7/328348 P/N: 324527	24-Mar-89		
60SD440 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332828 P/N: D324056	3-Apr-89		
60SD455 [Filed]	CBN/CBN COMPOSITE MASSES AND THEIR PREPARATION	United States	US	S/N: 7/630916 P/N: 5106792	20-Dec-90		
60SD458 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES FOR SINTERED METAL BONDED TOOLS	United States	US	S/N: 07/857132 P/N: 5250086	25-Mar-92		

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60SD461 [Filed]	BRAZED THERMALLY-STABLE POLYCRSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 365268 P/N: 4931363	12-Jun-89		
60SD469 [Filed]	POLYCRYSTALLINE CVD DIAMOND SUBSTRATE FOR SINGLE CRYSTAL EPITAXIAL GROWTH OF SEMICONDUCTORS FORMERLY	United States	US	S/N: 07/479486 P/N: 4981818	13-Feb-90		
60SD493 [Filed]	CVD DIAMOND COATED ANNULUS COMPONENTS AND THEIR METHOD OF FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/563367 P/N: 5096736	7-Aug-90		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/929239 P/N: 5256206	14-Aug-92		
60SD499 [Filed]	CVD DIAMOND COATED TWIST DRILLS	United States	US	S/N: 07/555879 P/N: 5022801	18-Jul-90		
60SD504 [Filed]	USING THERMALLY-STABLE DIAMOND OR CBN COMPACTS AS TIPS FOR ROTARY DRILLS	United States	US	S/N: 07/577379 P/N: 5273557	4-Sep-90		
60SD506 [Filed]	ISOTOPICALLY PURE SINGLE CRYSTAL EPITAXIAL DIAMOND FILMS AND THEIR PREPARATION	United States	US	S/N: 07/547651 P/N: 5360479	2-Jul-90		
60SD518 [Filed]	THERMALLY STABLE DENSE ELECTRICALLY CONDUCTIVE DIAMOND COMPACTS	United States	US	S/N: 07/773461 P/N: 5266236	9-Oct-91		
60SD528 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD567 [Filed]	CHEMICALLY BONDED ADHERENT COATING FOR ABRASIVE COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/710725 P/N: 5173091	4-Jun-91		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 08/220946 P/N: 5523121	31-Mar-94		
60SD577 [Filed]	CARBON FLUORIDE COMPOSITIONS	United States	US	S/N: 08/073991 P/N: 5380557	3-Jun-93		
60SD578 [Filed]	METHOD FOR MAKING SMOOTH SUBSTRATE MANDRELS	United States	US	S/N: 07/815478 P/N: 5176803	4-Mar-92		
60SD581 [Filed]	METHOD FOR PRODUCING UNIFORM CYLINDRICAL TUBES OF CVD DIAMOND	United States	US	S/N: 08/138888 P/N: 5387447	19-Oct-93		
60SD582 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD583 [Filed]	COATING FOR IMPROVED RETENTION OF CBN IN VITREOUS BOND MATRICES	United States	US	S/N: 08/005951 P/N: 5300129	19-Jan-93		
60SD584 [Filed]	DUAL-COATED DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/762999 P/N: 5143523	20-Sep-91		
60SD615 [Filed]	METHOD FOR CONTROLLING THE PARTICLE SIZE DISTRIBUTION IN THE PRODU CTION OF MULTICRYSTALLINE CUBIC BORON NITR IDE	United States	US	S/N: 07/995229 P/N: 5985228	22-Dec-92		
60SD628 [Filed]	DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/857192 P/N: 5405573	4-May-92		
60SD633 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES WITH AN ELECTROLESSLY DEPOSITED METAL LAYER	United States	US	S/N: 07/857139 P/N: 5232469	25-Mar-92		

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60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/322841 P/N: 5510193	13-Oct-94		
60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/595715 P/N: 5603070	2-Feb-96		
60SD645 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD647 [Filed]	FINE GRAIN DIAMOND WORKPIECES	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/095631 P/N: 5484330	21-Jul-93		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD653 [Filed]	REDUCTION OF STRESSES IN THE POLYCRYSTALLINE ABRASIVE LAYER OF A C OMPOSITE COMPACT IN THE IN SITU BONDED CAR BIDE/CARBIDE SUPPORT	United States	US	S/N: 08/489877 P/N: 5560754	13-Jun-95		
60SD658 [Filed]	ABRASIVE TOOL INSERT SEE CIP	United States	US	S/N: 08/105523 P/N: 5494477	11-Aug-93		
60SD660 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 07/985500 P/N: 5320988	1-Dec-92		
60SD662 [Filed]	METHOD OF SEPARATION OF PIECES FROM SUPER HARD MATERIAL BY PARTIAL LASER CUT AND PRESSURE CLEAVAGE	United States	US	S/N: 08/060459 P/N: 5387776	11-May-93		
60SD664 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD665 [Filed]	MEASURING THE STRENGTH OF ABRASIVE GRAINS	United States	US	S/N: 08/016638 P/N: 5392633	12-Feb-93		
60SD669 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD690 [Filed]	MULTIPLE GRAINED DIAMOND WIRE DIE	United States	US	S/N: 08/143802 P/N: 5361621	27-Oct-93		
60SD691 [Filed]	OPTICALLY IMPROVED DIAMOND WIRE DIE	United States	US	S/N: 08/148803 P/N: 5465603	5-Nov-93		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 08/571312 P/N: 5855996	12-Dec-95		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 09/087776 P/N: 6132675	29-May-98		
60SD694 [Filed]	DIAMOND WIRE DIE	United States	US	S/N: 08/121014 P/N: 5363687	14-Sep-93		
60SD696 [Filed]	ABRASIVE TOOL INSERT	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD698 [Filed]	CVD DIAMOND COATING ANNULUS COMPONENTS AND METHOD OF THEIR FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD701 [Filed]	DIAMOND WIRE DIE WITH POSITIONED OPENING	United States	US	S/N: 08/144168 P/N: 5377522	27-Oct-93		
60SD708 [Filed]	A METHOD FOR MANUFACTURING A DIAMOND ARTICLE	United States	US	S/N: 08/310449 P/N: 5529805	22-Sep-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/286076 P/N: 5500248	4-Aug-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/583360 P/N: 5647878	5-Jan-96		

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60SD712 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/238543 P/N: 5451430	5-May-94		
60SD713 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/654815 P/N: 5672395	29-May-96		
60SD714 [Filed]	ANNULAR DIAMOND BODIES	United States	US	S/N: 08/311658 P/N: 5551277	23-Sep-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/239156 P/N: 5512235	6-May-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/616997 P/N: 5773140	14-Mar-96		
60SD721 [Filed]	WIRE DRAWING DIE HAVING IMPROVED PHYSICAL PROPERTIES NO DIVISIONAL DUE PER GLL	United States	US	S/N: 08/412050 P/N: 5660075	28-Mar-95		
60SD726 [Filed]	A FINE GRAIN DIAMOND TOOL AND METHOD OF MANUFACTURE	United States	US	S/N: 08/551593 P/N: 5660936	1-Nov-95		
60SD728 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD731 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD732 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD745 [Filed]	METHOD FOR PRODUCING UNIFORMLY HIGH QUALITY ABRASIVE COMPACTS	United States	US	S/N: 08/555672 P/N: 5669944	13-Nov-95		
60SD749 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH REDUCED FAILURE DURING BRAZING	United States	US	S/N: 08/975028 P/N: 6042463	20-Nov-97		
60SD750 [Filed]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT NO DIV DUE PER EPA 5/1/97	United States	US	S/N: 08/591879 P/N: 5662720	26-Jan-96		
60SD752 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT (PDC) CUTTER WITH IMPROVED CUTTING CAPABILITY	United States	US	S/N: 08/975429 P/N: 6045440	20-Nov-97		
60SD753 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH IMPROVED CUTTING BY PREVENTING CHIP BUILD UP	United States	US	S/N: 09/131460 P/N: 6196910	10-Aug-98		
60SD760A [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT	United States	US	S/N: 08/777213 P/N: 5848657	27-Dec-96		
60SD768 [Filed]	AN IMPROVED ABRASIVE CUTTING ELEMENT AND DRILL BIT	United States	US	S/N: 08/611896 P/N: 5743346	6-Mar-96		
60SD769 [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT WITH DIAMOND RIDGE PATTERN	United States	US	S/N: 08/777222 P/N: 5829541	27-Dec-96		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 08/779417	7-Jan-97		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 10/411471	8-Apr-03		
60SD774 [Filed]	METHOD FOR PRODUCING CUBIC BORON NITRIDE USING MELAMINE AS A CATALYST	United States	US	S/N: 09/072144 P/N: 5869015	4-May-98		
60SD784 [Filed]	SYNTHETIC GASKET MATERIAL FOR USE IN HIGH PRESSURE PRESSES TRANS FM/MEGADIAMOND	United States	US	S/N: 08/874769 P/N: 5858525	13-Jun-97		

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60SD785 [Filed]	THERMALLY-DIFFUSED BORON DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/561128 P/N: 6322891	28-Apr-00		
60SD787 [Filed]	SUPERABRASIVE CUTTING ELEMENT WITH ENHANCED STIFFNESS, THERMAL CON DUCTIVITY AND CUTTING EFFICIENCY	United States	US	S/N: 08/783171 P/N: 6009963	14-Jan-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 08/950004 P/N: 5957005	14-Oct-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 09/358271 P/N: 6314836	21-Jul-99		
60SD794 [Filed]	AXISYMMETRIC CUTTING ELEMENT	United States	US	S/N: 09/492095 P/N: 6260640	27-Jan-00		
60SD795 [Filed]	SHAPED POLYCRYSTALLINE CUTTER ELEMENTS	United States	US	S/N: 09/072471 P/N: 6102143	4-May-98		
60SD796 [Filed]	TITANIUM CHROMIUM ALLOY COATED DIAMOND CRYSTALS FOR USE IN SAW BLA DE SEGMENTS AND METHOD FOR THEIR PRODUCTIO N	United States	US	S/N: 09/570957 P/N: 6319608	15-May-00		
60SD802 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORLESS AND FANCY COLORED DIAMONDS	United States	US	S/N: 10/338136	8-Jan-03		
60SD805 [Filed]	HIGH PRESSURE APPARATUS HAVING TRANSITION SLOPE BINDING RING THAT MITIGATES TENSILE STRESSES AND CORRESPONDI NG METHOD	United States	US	S/N: 09/740777 P/N: 6375446	19-Dec-00		
60SD806 [Filed]	LOW OXYGEN CUBIC BORON NITRIDE	United States	US	S/N: 10/001573	2-Nov-01		
60SD811 [Filed]	CRYSTAL MIXING FOR LOW POWER GRINDING	United States	US	S/N: 09/988244	16-Nov-01		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 60/139654	17-Jun-99		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 10/014547	14-Dec-01		
60SD817 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORED DIAMONDS	United States	US	S/N: 10/069362	25-Aug-00		
60SD820 [Filed]	SURFACE MODIFICATION OF COATED ABRASIVES TO ENHANCE THEIR ADHESION IN RESIN BOND TOOLS	United States	US	S/N: 09/901159	9-Jul-01		
60SD827 [Filed]	ABRASIVE TOOL INSERTS AND THEIR PRODUCTION	United States	US	S/N: 09/845540 P/N: 6315652	30-Apr-01		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 60/224485	11-Aug-00		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 10/344249	11-Feb-03		
60SD838 [Filed]	SILVER-COATED ABRASIVES, TOOLS CONTAINING SILVER-COATED ABRASIVES, AND APPLICATIONS OF THESE TOOLS	United States	US	S/N: 09/776141 P/N: 6666753	2-Feb-01		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/737667	15-Dec-00		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/799192	5-Mar-01		
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/935957	23-Aug-01		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 10/262784	2-Oct-02		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 09/987863 P/N: 6475254	16-Nov-01		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 10/174914 P/N: 6596040	19-Jun-02		
60SD852 [Filed]	HIGH PRESSURE PRODUCTION OF PEROVSKITES	United States	US	S/N: 09/931312	16-Aug-01		
RD14877 [Filed]	SINTERED POLYCRYSTALLINE DIAMOND COMPACT CONSTRUCTION WITH INTEGRA L HEAT SINK	United States	US	S/N: 652242 P/N: 4605343	20-Sep-84		
RD16334 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 830414 P/N: 4690691	13-Feb-86		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 07/332914 P/N: 5261959	4-Apr-89		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 08/150633 P/N: 5516554	10-Nov-93		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 48176 P/N: 4797138	11-May-87		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 07/048176 P/N: 4797138	11-May-87		
RD18116 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 07/744815 P/N: 5310447	12-Aug-91		
RD18402 [Filed]	EXCIMER LASER PATTERNING OF A NOVEL RESIST	United States	US	S/N: 224416 P/N: 4842677	26-Jul-88		
RD18693 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUB STRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/407179 P/N: 5110579	14-Sep-89		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD19567 [Filed]	FREE STANDING DIAMOND SHEET AND METHOD AND APPARATUS FOR MAKING SA ME	United States	US	S/N: 07/537963 P/N: 5464071	13-Jun-90		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/163608 P/N: 5419276	6-Dec-93		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/368732 P/N: 5540904	4-Jan-95		
RD20790 [Filed]	APPARATUS FOR PRODUCING DIAMONDS BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD20983 [Inactivated]	ARTIFICIAL POLYMER LATICES IN CORE-SHELL FORM AND METHOD OF PREPARATION	United States	US	S/N: 07/980,444 P/N: 5356955	23-Nov-93		
RD21018 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUBSTRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD21033 [Filed]	IMPROVED METHOD OF APPLYING METAL COATINGS ON DIAMOND AND ARTICLES MADE THEREFROM	United States	US	S/N: 07/722575 P/N: 5190796	27-Jun-91		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
RD21034 [Inactivated]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD21356 [Filed]	METHOD FOR PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION	United States	US	S/N: 07/845992 P/N: 5175929	4-Mar-92		
RD21493 [Filed]	METHOD OF APPLYING METAL COATING ON CUBIC ORON NITRIDE AND ARTICLE S MADE THEREFROM	United States	US	S/N: 07/738758 P/N: 5188643	1-Aug-91		
RD21661 [Filed]	PREHEATER FOR CVD DIAMOND REACTOR	United States	US	S/N: 08/306077 P/N: 5479874	14-Sep-94		
RD21796 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		
RD22021 [Filed]	SUBSTANTIALLY TRANSPARENT FREE STANDING DIAMOND FILMS	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD22055 [Filed]	METHOD FOR DETERMINING THICKNESS OF CHEMICAL VAPOR DEPOSITED LAYERS	United States	US	S/N: 07/991798 P/N: 5300313	16-Dec-92		
RD22294 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD22486 [Filed]	APPARATUS FOR PRODUCING DIAMOND BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD22514 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING GRAPHITE SUBSTRATE HOLDERS	United States	US	S/N: 08/096392 P/N: 5391229	26-Jul-93		
RD22530 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING THERM AL SPREADER	United States	US	S/N: 08/172797 P/N: 5397396	27-Dec-93		
RD22721 [Filed]	POLYCRYSTALLINE CARBON CONVERSION	United States	US	S/N: 09/206721 P/N: 6126741	7-Dec-98		
RD22800 [Filed]	TUNGSTEN METALIZATION OF CVD DIAMOND	United States	US	S/N: 08/100406 P/N: 5346719	2-Aug-93		
RD22976 [Filed]	METHOD FOR MAKING HIGH THERMAL CONDUCTING DIAMOND	United States	US	S/N: 08/316995 P/N: 5445106	3-Oct-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD23162 [Filed]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD23356 [Filed]	CHEMICAL VAPOR DEPOSITION OF POLYCRYSTALLINE DIAMOND WITH OR IENTATION AND GROWTH FACETS	United States	US	S/N: 08/264268 P/N: 5437891	23-Jun-94		
RD23427 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD23481 [Filed]	DIAMOND OPTICAL PLATE BEAMSPLITTER	United States	US	S/N: 08/538656 P/N: 5706135	3-Oct-95		
RD23502 [Filed]	APPARATUS FOR ANNEALING DIAMOND WATER JET MIXING TUBES	United States	US	S/N: 08/267181 P/N: 5468934	15-Jun-94		
RD23503 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD23511 [Filed]	ARTICLES HAVING THERMAL CONDUCTORS OF GRAPHITE	United States	US	S/N: 08/262796 P/N: 5494753	20-Jun-94		
RD23716 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
RD23717 [Filed]	ULTRAFAST OPTICAL MODULATOR	United States	US	S/N: 08/605417 P/N: 5659415	22-Feb-96		
RD23819 [Filed]	FABRICATION OF BRAZABLE IN AIR TOOL INSERTS AND INSERTS FABRICATED THEREBY	United States	US	S/N: 08/350572 P/N: 5626909	7-Dec-94		
RD23927 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499238 P/N: 5634369	7-Jul-95		
RD23948 [Filed]	DIAMOND FILM STRUCTURE WITH HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/316998 P/N: 5525815	3-Oct-94		
RD24002 [Filed]	SYNTHETIC DIAMOND PRODUCT	United States	US	S/N: 08/411181 P/N: 5503104	27-Mar-95		
RD24111 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD24416 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499237 P/N: 5636545	7-Jul-95		
RD24447 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499502 P/N: 5634370	7-Jul-95		
RD24450 [Filed]	ELECTRONIC APPARATUS WITH COMPLIANT METAL CHIP-SUBSTRATE BONDING LAYER(S)	United States	US	S/N: 08/457551 P/N: 5567985	1-Jun-95		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/201384 P/N: 6152977	30-Nov-98		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/484389 P/N: 6350191	14-Jan-00		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING S AME	United States	US	S/N: 09/484392 P/N: 6406776	14-Jan-00		
RD25308 [Filed]	SURFACE ENRICHED DIAMOND AND METHOD OF MAKING	United States	US	S/N: 09/783441	14-Feb-01		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/472104 P/N: 6258721	27-Dec-99		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/591189 P/N: 6242351	9-Jun-00		
RD27642 [Filed]	METHOD OF DETECTION OF NATURAL DIAMONDS THAT HAVE BEEN PROCESSED A T HIGH PRESSURE AND HIGH TEMPERATURES	United States	US	S/N: 09/430477 P/N: 6377340	29-Oct-99		
RD27888 [Filed]	FUNCTIONALIZED DIAMONDS WITH ENHANCED RETENTION IN RESIN BONDS, REACTIONS AND METHODS FOR PRODUCING SAME, AND ABRASIVES USING FUNCTIONALIZED DIAMONDS	United States	US	S/N: 09/576794 P/N: 6372002	23-May-00		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 09/793312 P/N: 6541115	26-Feb-01		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 10/255431	26-Sep-02		
RD28271 [Filed]	ABRASIVE DIAMOND COMPOSITE AND METHOD OF MAKING THEREOF	United States	US	S/N: 09/729525	4-Dec-00		
134047 [Filed]	METHOD TO STABILIZE FRAME SAW BLADES DURING CUT INITIATION	United States	US	134047 -1 Provisional [Filed] S/N 60/495,148	14-Aug-03		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH DISCRETE PARTICLE SIZE AREAS	United States	US	[Issued] S/N: 09/167,196 P/N: 6,187,068	[Awaiting] 10/6/98		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT AND THERMAL STABILITY	United States	US	[Issued] S/N: 08/523,868 P/N: 5,645,617	[Awaiting] 9/6/95		
[Awaiting]	COMPOSITE POLYCRYSTALLINE COMPACT WITH IMPROVED FRACTURE AND DELAMINATION RESISTANCE	United States	US	[Issued] S/N: 08/415,693 P/N: 5,564,511	[Awaiting] 5/15/95		
[Awaiting]	HIGH PRESSURE/HIGH TEMPERATURE PISTON-CYLINDER APPARATUS	United States	US	[Issued] S/N: 07/792,716 P/N: 5,244,368	[Awaiting] 11/15/91		
[Awaiting]	HIGH PRESSURE REACTION VESSEL	United States	US	[Issued] S/N: 07/826,809 P/N: 5,236,674	[Awaiting] 1/28/92		
[Awaiting]	MODIFIED END ASSEMBLY FOR HIGH PRESSURE, HIGH TEMPERATURE REACTION VESSELS	United States	US	[Issued] S/N: 07/660,332 P/N: 5,190,734	[Awaiting] 2/22/91		
[Awaiting]	HIGH STRENGTH COMPOSITE COMPONENT AND METHOD OF FABRICATION	United States	US	[Issued] S/N: 07/153,725 P/N: 5,032,147	[Awaiting] 2/8/88		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT RESISTANCE	United States	US	[Issued] S/N: 07/390,208 P/N: 5,011,515	[Awaiting] 8/7/89		
[Awaiting]	COMPOSITE COMPACT WITH A MORE THERMALLY STABLE CUTTING EDGE AND METHOD OF MANUFACTURING THE SAME	United States	US	[Issued] S/N: 07/390,204 P/N: 5,011,509	[Awaiting] 8/7/89		
[Awaiting]	COMPOSITE ABRASIVE COMPACT HAVING HIGH THERMAL STABILITY AND TRANSVERSE RUPTURE STRENGTH	United States	US	[Issued] S/N: 07/151,942 P/N: 4,871,377	[Awaiting] 2/3/88		
[Awaiting]	MATRIX CUTTER	United States	US	[Filed] S/N: 10/183,098	[Awaiting]		
[Awaiting]	ENHANCED METHOD FOR MAKING CVD DIAMOND	United States	US	[Filed] S/N: 10/161,266	[Awaiting] 6/3/02		

APPENDIX B

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
112200 [Filed]	POLYCRYSTALLINE DIAMOND TIPS ON CUTTERS FOR HIGH SPEED DISC SAWHEADS FOR APPLICATION IN THE TIMBER INDUSTRY	United States	US	Provisional [Filed] S/N: 60/473511	23-May-03		
123571 [Filed]	AUTOCATALYTIC NICKEL-BORON COATING PROCESS FOR DIAMOND PARTICLES	United States	US	Provisional [Filed] S/N: 60/438957	9-Jan-03		
123989 [Filed]	LASER SUPPORT NICKEL-PLATING OF SUPERABRASIVE TOOL	United States	US	S/N: 10/172,034	14-Jun-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	Provisional [Filed] S/N: 60/395,182	10-Jul-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	S/N: 10/458903 P/N: 6666753	11-Jun-03		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	Provisional [Filed] S/N: 60/395,181	10-Jul-02		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	S/N: 10/455008	5-Jun-03		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	Provisional [Filed] S/N: 60/432222	10-Dec-02		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	S/N 10/731,066	9-Dec-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	Provisional [Filed] S/N: 60/382209	21-May-02		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	S/N: 10/437469	8-Jul-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	125877 -7 Original [Filed]			
126337 [Filed]	SCRATCH-PROOF COMPOSITE WATCH GLASS	United States	US	Provisional [Filed] S/N: 60/399778	31-Jul-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	Provisional [Filed] S/N: 60/391707	26-Jun-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	S/N: 10/437516	14-May-03		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	Provisional [Filed] S/N: 60/414987	1-Oct-02		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	S/N 10/621,710	17-Jul-03		
129177 [Filed]	EXTRUSION AND COMPOUNDING EQUIPMENT COMPONENTS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445631	7-Feb-03		
129178 [Filed]	IMPROVED WEAR RESISTANT COMPONENTS FOR SIZE REDUCTION AND SIZE CLASSIFICATION EQUIPMENT	United States	US	Provisional [Filed] S/N: 60/445615	7-Feb-03		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
129182 [Filed]	WEAR CONTROL IN CONTINUOUS GLASS FIBER PLANTS	United States	US	Provisional [Filed] S/N: 60/445614	7-Feb-03		
129184 [Filed]	WEAR-RESISTANT DRILL BIT BODIES AND OTHER COMPONENTS FOR OIL AND GAS DRILLING	United States	US	Provisional [Filed] S/N: 60/445659	7-Feb-03		
129892 [Filed]	WEAR AND CORROSION RESISTANT ORIFICE AND RELATED COMPONENTS	United States	US	Provisional [Filed] S/N: 60/445633	7-Feb-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/440455	15-Jan-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/464517	22-Apr-03		
131068 [Filed]	WEAR AND CORROSION PREVENTION IN FIREARMS	United States	US	Provisional [Filed] S/N: 60/445609	7-Feb-03		
132255 [Filed]	AIRCRAFT ENGINE WEAR PARTS	United States	US	Provisional [Filed] S/N: 60/445632	7-Feb-03		
132270 [Filed]	CLIPPER BLADE SETS AND COMBS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445610	7-Feb-03		
132875 [Filed]	SELECTION OF DIAMONDS GRIT MORPHOLOGY AND SIZE DISTRIBUTION FOR CMP CONDITIONER APPLICATION	United States	US	Provisional [Filed] 60/509,625	8-Oct-03		
133139 [Filed]	IMPROVED WEAR PEROFRMANCE TOOLS FOR METAL, PLASTIC, CERAMIC AND COMPOSITE FORMING	United States	US	Provisional [Filed] S/N: 60/447808	14-Feb-03		
133140 [Filed]	PCD AND PCBN TOOL BLANKS WITH PREFIXED BRAZE ALLOY	United States	US	Provisional [Filed] S/N: 60/445613	7-Feb-03		
133141 [Filed]	COATINGS WITH HIGHLY TORTUOUS SURFACE TOPOGRAPHY FOR ABRASIVE/SUPERABRASIVE PARTICLES USED IN METALS/CERAMIC/POLYMER MATRIX COMPOSITES	United States	US	Provisional [Filed] S/N: 60/469285	8-May-03		
133615 [Filed]	IMPROVED TOOLS FOR MACHINING FIBER CEMENTS	United States	US	Provisional [Filed] 60/453,487	11-Mar-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	Provisional [Filed] S/N: 60/470306	14-May-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	S/N 10/690,761	22-Oct-03		
133920 [Filed]	DRILL BITS, ROUTER BITS, PROFILE CUTTERS, FILES, PLANING AND SAW BLADES WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/469287	9-May-03		
133975 [Filed]	METHOD TO IMPROVE TOOL INTEGRITY WHEN CUTTING STONE	United States	US	Provisional [Filed] S/N 60/495,148	14-Aug-03		
135143 [Filed]	A METHOD OF MAKING ABRASIVE TOOLS FROM BI-MODAL DIAMOND OR CUBIC BORON NITRIDE POWDER	United States	US	Provisional [Filed] S/N: 60/467311	2-May-03		

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136255 [Filed]	SINTERED COMPACT FOR USE IN MACHINING VARIOUS CAST IRON MATERIALS	United States	US	Provisional [Filed] S/N 60/526,576	3-Dec-03		
145361 [Filed]	COMPRESSION CONTAINER FOR POLYCRYSTALLINE WIRE DIE	United States	US	Provisional [Filed] S/N 60/528,372	10-Dec-03		
60SD10 [Filed]	DIAMOND AND CBN ABRASIVE COMPACTS USING SIZE SELECTIVE ABRASIVE PA RTICLE LAYERS	United States	US	S/N: 219289 P/N: 4311490	7-Sep-88		
60SD147 [Filed]	RE-SINTERED BORON-RICH POLYCRYSTALLINE CUBIC BORON NITRIDE AND MET HOD FOR MAKING SAME	United States	US	S/N: 823893 P/N: 4673414	29-Jan-86		
60SD184 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD240 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 542081 P/N: 4525179	14-Oct-83		
60SD242 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD245 [Filed]	MERGED WITH 60-SD-259 FOR FILING	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD24559 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD246 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD249 [Filed]	SWEEP THROUGH PROCESS FOR MAKING POLYCRYSTALLINE COMPACTS	United States	US	S/N: 536221 P/N: 4518659	23-Sep-83		
60SD251 [Filed]	IMPROVED PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 552081 P/N: 4525179	14-Oct-83		
60SD254 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 06/920041 P/N: 4738689	16-Oct-86		
60SD256 [Filed]	POLYCRYSTALLINE SANDWICH COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/277875 P/N: 5009673	30-Nov-88		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 697668 P/N: 4810447	4-Feb-85		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 8491 P/N: 4832708	27-Jan-87		
60SD261 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 7/366943 P/N: 5043120	16-Jun-89		
60SD262 [Filed]	BRAZED COMPOSITE COMPACT IMPLEMENTS	United States	US	S/N: 624064 P/N: 4527998	25-Jun-84		
60SD303 [Filed]	REFRACTORY METAL OXIDE COATED ABRASIVES AND GRINDING WHEELS MADE THEREFROM	United States	US	S/N: 07/358728 P/N: 4951427	30-May-89		
60SD305 [Filed]	STUD-MOUNTED POLYCRYSTALLINE TOOTHED DIAMOND CUTTING BLANKS	United States	US	S/N: 7/192872 P/N: D317010	11-May-88		
60SD308 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 7/365268 P/N: 4931363	12-Jun-89		

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60SD30811 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 158575 P/N: 4899922	22-Feb-88		
60SD317 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 920041 P/N: 47386689	16-Oct-86		
60SD318 [Filed]	BONDING OF THERMALLY STABLE ABRASIVE COMPACTS TO CARBIDE SUPPORTS	United States	US	S/N: 07/158336 P/N: 4850523	22-Feb-88		
60SD327 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 008491 P/N: 4832708	29-Jan-87		
60SD33 [Filed]	OPTICAL WINDOWS MADE OF POLYCRYSTALLINE ADAMANTANE BORON NITRIDE OR DIAMOND	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD332 [Filed]	METHOD OF MAKING DIAMOND TOOL	United States	US	S/N: 713966 P/N: 4661180	25-Mar-85		
60SD333 [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 153466 P/N: 4828582	3-Feb-88		
60SD333V [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 793462 P/N: 4828582	1-Sep-88		
60SD358 [Filed]	PRODUCTS AND PROCESS FOR MAKING MULTIGRAIN ABRASIVE COMPACTS	United States	US	S/N: 07/669259 P/N: 5211726	14-Mar-91		
60SD364 [Filed]	MULTIGRAIN ABRASIVE PARTICLES	United States	US	S/N: 07/669124 P/N: 5106392	14-Mar-91		
60SD367 [Filed]	CHIP BREAKER FOR POLYCRYSTALLINE CBN AND DIAMOND COMPACTS	United States	US	S/N: 7/429661 P/N: 5026960	31-Oct-89		
60SD368 [Filed]	DIAMOND AND CUBIC BORON NITRIDE	United States	US	S/N: 156272 P/N: 4807402	12-Feb-88		
60SD389 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANKS	United States	US	S/N: 328347 P/N: D330206	24-Mar-89		
60SD390 [Filed]	RECIPROCATING POINT ROTARY DIAMOND	United States	US	S/N: 07/635082 P/N: 5172681	28-Dec-90		
60SD401 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332814 P/N: D325226	3-Apr-89		
60SD412 [Filed]	SAWBLADE SEGMENTS UTILIZING POLYCRYSTALLINE DIAMOND GRIT	United States	US	S/N: 262405 P/N: 4883500	25-Oct-88		
60SD419 [Filed]	SUPPORTED THERMALLY STABLE CUBIC BORON NITRIDE TOOLS BLANKS AND METHOD FOR MAKING THE SAME	United States	US	S/N: 7/394349 P/N: 4985050	15-Aug-89		
60SD428 [Filed]	DIAMOND COMPACTS FOR ROCK DRILLING AND MACHINING	United States	US	S/N: 7/420191 P/N: 5022894	12-Oct-89		
60SD437 [Filed]	METHOD FOR PRODUCING POLYCRYSTALLINE COMPACT TOOL BLANKS WITH FLAT CARBIDE SUPPORT/DIAMOND OR CBN INTERFACES	United States	US	S/N: 331928 P/N: 4954139	31-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 328348 P/N: D324527	24-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 7/328348 P/N: 324527	24-Mar-89		
60SD440 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332828 P/N: D324056	3-Apr-89		
60SD455 [Filed]	CBN/CBN COMPOSITE MASSES AND THEIR PREPARATION	United States	US	S/N: 7/630916 P/N: 5106792	20-Dec-90		
60SD458 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES FOR SINTERED METAL BONDED TOOLS	United States	US	S/N: 07/857132 P/N: 5250086	25-Mar-92		

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60SD461 [Filed]	BRAZED THERMALLY-STABLE POLYCRSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 365268 P/N: 4931363	12-Jun-89		
60SD469 [Filed]	POLYCRYSTALLINE CVD DIAMOND SUBSTRATE FOR SINGLE CRYSTAL EPITAXIAL GROWTH OF SEMICONDUCTORS FORMERLY	United States	US	S/N: 07/479486 P/N: 4981818	13-Feb-90		
60SD493 [Filed]	CVD DIAMOND COATED ANNULUS COMPONENTS AND THEIR METHOD OF FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/563367 P/N: 5096736	7-Aug-90		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/929239 P/N: 5256206	14-Aug-92		
60SD499 [Filed]	CVD DIAMOND COATED TWIST DRILLS	United States	US	S/N: 07/555879 P/N: 5022801	18-Jul-90		
60SD504 [Filed]	USING THERMALLY-STABLE DIAMOND OR CBN COMPACTS AS TIPS FOR ROTARY DRILLS	United States	US	S/N: 07/577379 P/N: 5273557	4-Sep-90		
60SD506 [Filed]	ISOTOPICALLY PURE SINGLE CRYSTAL EPITAXIAL DIAMOND FILMS AND THEIR PREPARATION	United States	US	S/N: 07/547651 P/N: 5360479	2-Jul-90		
60SD518 [Filed]	THERMALLY STABLE DENSE ELECTRICALLY CONDUCTIVE DIAMOND COMPACTS	United States	US	S/N: 07/773461 P/N: 5266236	9-Oct-91		
60SD528 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD567 [Filed]	CHEMICALLY BONDED ADHERENT COATING FOR ABRASIVE COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/710725 P/N: 5173091	4-Jun-91		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 08/220946 P/N: 5523121	31-Mar-94		
60SD577 [Filed]	CARBON FLUORIDE COMPOSITIONS	United States	US	S/N: 08/073991 P/N: 5380557	3-Jun-93		
60SD578 [Filed]	METHOD FOR MAKING SMOOTH SUBSTRATE MANDRELS	United States	US	S/N: 07/815478 P/N: 5176803	4-Mar-92		
60SD581 [Filed]	METHOD FOR PRODUCING UNIFORM CYLINDRICAL TUBES OF CVD DIAMOND	United States	US	S/N: 08/138888 P/N: 5387447	19-Oct-93		
60SD582 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD583 [Filed]	COATING FOR IMPROVED RETENTION OF CBN IN VITREOUS BOND MATRICES	United States	US	S/N: 08/005951 P/N: 5300129	19-Jan-93		
60SD584 [Filed]	DUAL-COATED DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/762999 P/N: 5143523	20-Sep-91		
60SD615 [Filed]	METHOD FOR CONTROLLING THE PARTICLE SIZE DISTRIBUTION IN THE PRODU CTION OF MULTICRYSTALLINE CUBIC BORON NITR IDE	United States	US	S/N: 07/995229 P/N: 5985228	22-Dec-92		
60SD628 [Filed]	DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/857192 P/N: 5405573	4-May-92		
60SD633 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES WITH AN ELECTROLESSLY DEPOSITED METAL LAYER	United States	US	S/N: 07/857139 P/N: 5232469	25-Mar-92		

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60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/322841 P/N: 5510193	13-Oct-94		
60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/595715 P/N: 5603070	2-Feb-96		
60SD645 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD647 [Filed]	FINE GRAIN DIAMOND WORKPIECES	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/095631 P/N: 5484330	21-Jul-93		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD653 [Filed]	REDUCTION OF STRESSES IN THE POLYCRYSTALLINE ABRASIVE LAYER OF A C OMPOSITE COMPACT IN THE IN SITU BONDED CAR BIDE/CARBIDE SUPPORT	United States	US	S/N: 08/489877 P/N: 5560754	13-Jun-95		
60SD658 [Filed]	ABRASIVE TOOL INSERT SEE CIP	United States	US	S/N: 08/105523 P/N: 5494477	11-Aug-93		
60SD660 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 07/985500 P/N: 5320988	1-Dec-92		
60SD662 [Filed]	METHOD OF SEPARATION OF PIECES FROM SUPER HARD MATERIAL BY PARTIAL LASER CUT AND PRESSURE CLEAVAGE	United States	US	S/N: 08/060459 P/N: 5387776	11-May-93		
60SD664 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD665 [Filed]	MEASURING THE STRENGTH OF ABRASIVE GRAINS	United States	US	S/N: 08/016638 P/N: 5392633	12-Feb-93		
60SD669 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD690 [Filed]	MULTIPLE GRAINED DIAMOND WIRE DIE	United States	US	S/N: 08/143802 P/N: 5361621	27-Oct-93		
60SD691 [Filed]	OPTICALLY IMPROVED DIAMOND WIRE DIE	United States	US	S/N: 08/148803 P/N: 5465603	5-Nov-93		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 08/571312 P/N: 5855996	12-Dec-95		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 09/087776 P/N: 6132675	29-May-98		
60SD694 [Filed]	DIAMOND WIRE DIE	United States	US	S/N: 08/121014 P/N: 5363687	14-Sep-93		
60SD696 [Filed]	ABRASIVE TOOL INSERT	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD698 [Filed]	CVD DIAMOND COATING ANNULUS COMPONENTS AND METHOD OF THEIR FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD701 [Filed]	DIAMOND WIRE DIE WITH POSITIONED OPENING	United States	US	S/N: 08/144168 P/N: 5377522	27-Oct-93		
60SD708 [Filed]	A METHOD FOR MANUFACTURING A DIAMOND ARTICLE	United States	US	S/N: 08/310449 P/N: 5529805	22-Sep-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/286076 P/N: 5500248	4-Aug-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/583360 P/N: 5647878	5-Jan-96		

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60SD712 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/238543 P/N: 5451430	5-May-94		
60SD713 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/654815 P/N: 5672395	29-May-96		
60SD714 [Filed]	ANNULAR DIAMOND BODIES	United States	US	S/N: 08/311658 P/N: 5551277	23-Sep-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/239156 P/N: 5512235	6-May-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/616997 P/N: 5773140	14-Mar-96		
60SD721 [Filed]	WIRE DRAWING DIE HAVING IMPROVED PHYSICAL PROPERTIES NO DIVISIONAL DUE PER GLL	United States	US	S/N: 08/412050 P/N: 5660075	28-Mar-95		
60SD726 [Filed]	A FINE GRAIN DIAMOND TOOL AND METHOD OF MANUFACTURE	United States	US	S/N: 08/551593 P/N: 5660936	1-Nov-95		
60SD728 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD731 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD732 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD745 [Filed]	METHOD FOR PRODUCING UNIFORMLY HIGH QUALITY ABRASIVE COMPACTS	United States	US	S/N: 08/555672 P/N: 5669944	13-Nov-95		
60SD749 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH REDUCED FAILURE DURING BRAZING	United States	US	S/N: 08/975028 P/N: 6042463	20-Nov-97		
60SD750 [Filed]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT NO DIV DUE PER EPA 5/1/97	United States	US	S/N: 08/591879 P/N: 5662720	26-Jan-96		
60SD752 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT (PDC) CUTTER WITH IMPROVED CUTTING CAPABILITY	United States	US	S/N: 08/975429 P/N: 6045440	20-Nov-97		
60SD753 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH IMPROVED CUTTING BY PREVENTING CHIP BUILD UP	United States	US	S/N: 09/131460 P/N: 6196910	10-Aug-98		
60SD760A [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT	United States	US	S/N: 08/777213 P/N: 5848657	27-Dec-96		
60SD768 [Filed]	AN IMPROVED ABRASIVE CUTTING ELEMENT AND DRILL BIT	United States	US	S/N: 08/611896 P/N: 5743346	6-Mar-96		
60SD769 [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT WITH DIAMOND RIDGE PATTERN	United States	US	S/N: 08/777222 P/N: 5829541	27-Dec-96		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 08/779417	7-Jan-97		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 10/411471	8-Apr-03		
60SD774 [Filed]	METHOD FOR PRODUCING CUBIC BORON NITRIDE USING MELAMINE AS A CATALYST	United States	US	S/N: 09/072144 P/N: 5869015	4-May-98		
60SD784 [Filed]	SYNTHETIC GASKET MATERIAL FOR USE IN HIGH PRESSURE PRESSES TRANS FM/MEGADIAMOND	United States	US	S/N: 08/874769 P/N: 5858525	13-Jun-97		

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60SD785 [Filed]	THERMALLY-DIFFUSED BORON DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/561128 P/N: 6322891	28-Apr-00		
60SD787 [Filed]	SUPERABRASIVE CUTTING ELEMENT WITH ENHANCED STIFFNESS, THERMAL CON DUCTIVITY AND CUTTING EFFICIENCY	United States	US	S/N: 08/783171 P/N: 6009963	14-Jan-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 08/950004 P/N: 5957005	14-Oct-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 09/358271 P/N: 6314836	21-Jul-99		
60SD794 [Filed]	AXISYMMETRIC CUTTING ELEMENT	United States	US	S/N: 09/492095 P/N: 6260640	27-Jan-00		
60SD795 [Filed]	SHAPED POLYCRYSTALLINE CUTTER ELEMENTS	United States	US	S/N: 09/072471 P/N: 6102143	4-May-98		
60SD796 [Filed]	TITANIUM CHROMIUM ALLOY COATED DIAMOND CRYSTALS FOR USE IN SAW BLA DE SEGMENTS AND METHOD FOR THEIR PRODUCTIO N	United States	US	S/N: 09/570957 P/N: 6319608	15-May-00		
60SD802 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORLESS AND FANCY COLORED DIAMONDS	United States	US	S/N: 10/338136	8-Jan-03		
60SD805 [Filed]	HIGH PRESSURE APPARATUS HAVING TRANSITION SLOPE BINDING RING THAT MITIGATES TENSILE STRESSES AND CORRESPONDI NG METHOD	United States	US	S/N: 09/740777 P/N: 6375446	19-Dec-00		
60SD806 [Filed]	LOW OXYGEN CUBIC BORON NITRIDE	United States	US	S/N: 10/001573	2-Nov-01		
60SD811 [Filed]	CRYSTAL MIXING FOR LOW POWER GRINDING	United States	US	S/N: 09/988244	16-Nov-01		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 60/139654	17-Jun-99		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 10/014547	14-Dec-01		
60SD817 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORED DIAMONDS	United States	US	S/N: 10/069362	25-Aug-00		
60SD820 [Filed]	SURFACE MODIFICATION OF COATED ABRASIVES TO ENHANCE THEIR ADHESION IN RESIN BOND TOOLS	United States	US	S/N: 09/901159	9-Jul-01		
60SD827 [Filed]	ABRASIVE TOOL INSERTS AND THEIR PRODUCTION	United States	US	S/N: 09/845540 P/N: 6315652	30-Apr-01		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 60/224485	11-Aug-00		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 10/344249	11-Feb-03		
60SD838 [Filed]	SILVER-COATED ABRASIVES, TOOLS CONTAINING SILVER-COATED ABRASIVES, AND APPLICATIONS OF THESE TOOLS	United States	US	S/N: 09/776141 P/N: 6666753	2-Feb-01		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/737667	15-Dec-00		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/799192	5-Mar-01		
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/935957	23-Aug-01		

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60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 10/262784	2-Oct-02		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 09/987863 P/N: 6475254	16-Nov-01		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 10/174914 P/N: 6596040	19-Jun-02		
60SD852 [Filed]	HIGH PRESSURE PRODUCTION OF PEROVSKITES	United States	US	S/N: 09/931312	16-Aug-01		
RD14877 [Filed]	SINTERED POLYCRYSTALLINE DIAMOND COMPACT CONSTRUCTION WITH INTEGRA L HEAT SINK	United States	US	S/N: 652242 P/N: 4605343	20-Sep-84		
RD16334 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 830414 P/N: 4690691	13-Feb-86		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 07/332914 P/N: 5261959	4-Apr-89		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 08/150633 P/N: 5516554	10-Nov-93		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 48176 P/N: 4797138	11-May-87		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 07/048176 P/N: 4797138	11-May-87		
RD18116 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 07/744815 P/N: 5310447	12-Aug-91		
RD18402 [Filed]	EXCIMER LASER PATTERNING OF A NOVEL RESIST	United States	US	S/N: 224416 P/N: 4842677	26-Jul-88		
RD18693 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUB STRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/407179 P/N: 5110579	14-Sep-89		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD19567 [Filed]	FREE STANDING DIAMOND SHEET AND METHOD AND APPARATUS FOR MAKING SA ME	United States	US	S/N: 07/537963 P/N: 5464071	13-Jun-90		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/163608 P/N: 5419276	6-Dec-93		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/368732 P/N: 5540904	4-Jan-95		
RD20790 [Filed]	APPARATUS FOR PRODUCING DIAMONDS BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD20983 [Inactivated]	ARTIFICIAL POLYMER LATICES IN CORE-SHELL FORM AND METHOD OF PREPARATION	United States	US	S/N: 07/980,444 P/N: 5356955	23-Nov-93		
RD21018 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUBSTRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD21033 [Filed]	IMPROVED METHOD OF APPLYING METAL COATINGS ON DIAMOND AND ARTICLES MADE THEREFROM	United States	US	S/N: 07/722575 P/N: 5190796	27-Jun-91		

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RD21034 [Inactivated]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD21356 [Filed]	METHOD FOR PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION	United States	US	S/N: 07/845992 P/N: 5175929	4-Mar-92		
RD21493 [Filed]	METHOD OF APPLYING METAL COATING ON CUBIC ORON NITRIDE AND ARTICLE S MADE THEREFROM	United States	US	S/N: 07/738758 P/N: 5188643	1-Aug-91		
RD21661 [Filed]	PREHEATER FOR CVD DIAMOND REACTOR	United States	US	S/N: 08/306077 P/N: 5479874	14-Sep-94		
RD21796 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		
RD22021 [Filed]	SUBSTANTIALLY TRANSPARENT FREE STANDING DIAMOND FILMS	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD22055 [Filed]	METHOD FOR DETERMINING THICKNESS OF CHEMICAL VAPOR DEPOSITED LAYERS	United States	US	S/N: 07/991798 P/N: 5300313	16-Dec-92		
RD22294 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD22486 [Filed]	APPARATUS FOR PRODUCING DIAMOND BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD22514 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING GRAPHITE SUBSTRATE HOLDERS	United States	US	S/N: 08/096392 P/N: 5391229	26-Jul-93		
RD22530 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING THERM AL SPREADER	United States	US	S/N: 08/172797 P/N: 5397396	27-Dec-93		
RD22721 [Filed]	POLYCRYSTALLINE CARBON CONVERSION	United States	US	S/N: 09/206721 P/N: 6126741	7-Dec-98		
RD22800 [Filed]	TUNGSTEN METALIZATION OF CVD DIAMOND	United States	US	S/N: 08/100406 P/N: 5346719	2-Aug-93		
RD22976 [Filed]	METHOD FOR MAKING HIGH THERMAL CONDUCTING DIAMOND	United States	US	S/N: 08/316995 P/N: 5445106	3-Oct-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD23162 [Filed]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD23356 [Filed]	CHEMICAL VAPOR DEPOSITION OF POLYCRYSTALLINE DIAMOND WITH OR IENTATION AND GROWTH FACETS	United States	US	S/N: 08/264268 P/N: 5437891	23-Jun-94		
RD23427 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD23481 [Filed]	DIAMOND OPTICAL PLATE BEAMSPLITTER	United States	US	S/N: 08/538656 P/N: 5706135	3-Oct-95		
RD23502 [Filed]	APPARATUS FOR ANNEALING DIAMOND WATER JET MIXING TUBES	United States	US	S/N: 08/267181 P/N: 5468934	15-Jun-94		
RD23503 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD23511 [Filed]	ARTICLES HAVING THERMAL CONDUCTORS OF GRAPHITE	United States	US	S/N: 08/262796 P/N: 5494753	20-Jun-94		
RD23716 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		

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RD23717 [Filed]	ULTRAFAST OPTICAL MODULATOR	United States	US	S/N: 08/605417 P/N: 5659415	22-Feb-96		
RD23819 [Filed]	FABRICATION OF BRAZABLE IN AIR TOOL INSERTS AND INSERTS FABRICATED THEREBY	United States	US	S/N: 08/350572 P/N: 5626909	7-Dec-94		
RD23927 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499238 P/N: 5634369	7-Jul-95		
RD23948 [Filed]	DIAMOND FILM STRUCTURE WITH HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/316998 P/N: 5525815	3-Oct-94		
RD24002 [Filed]	SYNTHETIC DIAMOND PRODUCT	United States	US	S/N: 08/411181 P/N: 5503104	27-Mar-95		
RD24111 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD24416 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499237 P/N: 5636545	7-Jul-95		
RD24447 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499502 P/N: 5634370	7-Jul-95		
RD24450 [Filed]	ELECTRONIC APPARATUS WITH COMPLIANT METAL CHIP-SUBSTRATE BONDING LAYER(S)	United States	US	S/N: 08/457551 P/N: 5567985	1-Jun-95		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/201384 P/N: 6152977	30-Nov-98		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/484389 P/N: 6350191	14-Jan-00		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING S AME	United States	US	S/N: 09/484392 P/N: 6406776	14-Jan-00		
RD25308 [Filed]	SURFACE ENRICHED DIAMOND AND METHOD OF MAKING	United States	US	S/N: 09/783441	14-Feb-01		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/472104 P/N: 6258721	27-Dec-99		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/591189 P/N: 6242351	9-Jun-00		
RD27642 [Filed]	METHOD OF DETECTION OF NATURAL DIAMONDS THAT HAVE BEEN PROCESSED A T HIGH PRESSURE AND HIGH TEMPERATURES	United States	US	S/N: 09/430477 P/N: 6377340	29-Oct-99		
RD27888 [Filed]	FUNCTIONALIZED DIAMONDS WITH ENHANCED RETENTION IN RESIN BONDS, REACTIONS AND METHODS FOR PRODUCING SAME, AND ABRASIVES USING FUNCTIONALIZED DIAMONDS	United States	US	S/N: 09/576794 P/N: 6372002	23-May-00		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 09/793312 P/N: 6541115	26-Feb-01		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 10/255431	26-Sep-02		
RD28271 [Filed]	ABRASIVE DIAMOND COMPOSITE AND METHOD OF MAKING THEREOF	United States	US	S/N: 09/729525	4-Dec-00		
134047 [Filed]	METHOD TO STABILIZE FRAME SAW BLADES DURING CUT INITIATION	United States	US	134047 -1 Provisional [Filed]	14-Aug-03		

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[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH DISCRETE PARTICLE SIZE AREAS	United States	US	[Issued] S/N: 09/167,196 P/N: 6,187,068	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT AND THERMAL STABILITY	United States	US	[Issued] S/N: 08/523,868 P/N: 5,645,617	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE COMPACT WITH IMPROVED FRACTURE AND DELAMINATION RESISTANCE	United States	US	[Issued] S/N: 08/415,693 P/N: 5,564,511	[Awaiting]		
[Awaiting]	HIGH PRESSURE/HIGH TEMPERATURE PISTON-CYLINDER APPARATUS	United States	US	[Issued] S/N: 07/792,716 P/N: 5,244,368	[Awaiting]		
[Awaiting]	HIGH PRESSURE REACTION VESSEL	United States	US	[Issued] S/N: 07/826,809 P/N: 5,236,674	[Awaiting]		
[Awaiting]	MODIFIED END ASSEMBLY FOR HIGH PRESSURE, HIGH TEMPERATURE REACTION VESSELS	United States	US	[Issued] S/N: 07/660,332 P/N: 5,190,734	[Awaiting]		
[Awaiting]	HIGH STRENGTH COMPOSITE COMPONENT AND METHOD OF FABRICATION	United States	US	[Issued] S/N: 07/153,725 P/N: 5,032,147	[Awaiting]		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT RESISTANCE	United States	US	[Issued] S/N: 07/390,208 P/N: 5,011,515	[Awaiting]		
[Awaiting]	COMPOSITE COMPACT WITH A MORE THERMALLY STABLE CUTTING EDGE AND METHOD OF MANUFACTURING THE SAME	United States	US	[Issued] S/N: 07/390,204 P/N: 5,011,509	[Awaiting]		
[Awaiting]	COMPOSITE ABRASIVE COMPACT HAVING HIGH THERMAL STABILITY AND TRANSVERSE RUPTURE STRENGTH	United States	US	[Issued] S/N: 07/151,942 P/N: 4,871,377	[Awaiting]		
[Awaiting]	MATRIX CUTTER	United States	US	[Filed] S/N: 10/183,098	[Awaiting]		
[Awaiting]	ENHANCED METHOD FOR MAKING CVD DIAMOND	United States	US	[Filed] S/N: 10/161,266	[Awaiting]		

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112200 [Filed]	POLYCRYSTALLINE DIAMOND TIPS ON CUTTERS FOR HIGH SPEED DISC SAWHEADS FOR APPLICATION IN THE TIMBER INDUSTRY	United States	US	Provisional [Filed] S/N: 60/473511	23-May-03		
123571 [Filed]	AUTOCATALYTIC NICKEL-BORON COATING PROCESS FOR DIAMOND PARTICLES	United States	US	Provisional [Filed] S/N: 60/438957	9-Jan-03		
123989 [Filed]	LASER SUPPORT NICKEL-PLATING OF SUPERABRASIVE TOOL	United States	US	S/N: 10/172,034	14-Jun-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	Provisional [Filed] S/N: 60/395,182	10-Jul-02		
124337 [Filed]	CUTTING TOOL INSERT DESIGNED WITH MINIMIZED RESIDUAL TENSILE STRESSES	United States	US	S/N: 10/458903 P/N: 6666753	11-Jun-03		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	Provisional [Filed] S/N: 60/395,181	10-Jul-02		
125174 [Filed]	CUTTING TOOL WITH TWO-SLOPE PROFILE DESIGNED WITH MINIMIZED AXIAL SURFACE RESIDUAL STRESSES	United States	US	S/N: 10/455008	5-Jun-03		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US	Provisional [Filed] S/N: 60/432222	10-Dec-02		
125185 [Filed]	METHOD TO IMPROVE WEAR UNIFORMITY OF DIAMOND-CONTAINING SEGMENTS ON BLADES FOR STABBING GRANITE	United States	US		9-Dec-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	Provisional [Filed] S/N: 60/382209	21-May-02		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	S/N: 10/437469	8-Jul-03		
125877 [Filed]	POLYCRYSTALLINE DIAMOND CUTTERS AND ENHANCED IMPACT RESISTANCE	United States	US	125877 -7 Original [Filed]			
126337 [Filed]	SCRATCH-PROOF COMPOSITE WATCH GLASS	United States	US	Provisional [Filed] S/N: 60/399778	31-Jul-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	Provisional [Filed] S/N: 60/391707	26-Jun-02		
126360 [Filed]	A SINTERED COMPACT FOR USE IN MACHINING CHEMICALLY REACTIVE MATERIALS	United States	US	S/N: 10/437516	14-May-03		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US	Provisional [Filed] S/N: 60/414987	1-Oct-02		
126855 [Filed]	METHOD FOR PRODUCING SINTERED POLYCRYSTALLING DIAMOND ON TUNGSTEN CARBIDE SUBSTRATES	United States	US		17-Jul-03		
129177 [Filed]	EXTRUSION AND COMPOUNDING EQUIPMENT COMPONENTS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445631	7-Feb-03		
129178 [Filed]	IMPROVED WEAR RESISTANT COMPONENTS FOR SIZE REDUCTION AND SIZE CLASSIFICATION EQUIPMENT	United States	US	Provisional [Filed] S/N: 60/445615	7-Feb-03		

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129182 [Filed]	WEAR CONTROL IN CONTINUOUS GLASS FIBER PLANTS	United States	US	Provisional [Filed] S/N: 60/445614	7-Feb-03		
129184 [Filed]	WEAR-RESISTANT DRILL BIT BODIES AND OTHER COMPONENTS FOR OIL AND GAS DRILLING	United States	US	Provisional [Filed] S/N: 60/445659	7-Feb-03		
129892 [Filed]	WEAR AND CORROSION RESISTANT ORIFICE AND RELATED COMPONENTS	United States	US	Provisional [Filed] S/N: 60/445633	7-Feb-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/440455	15-Jan-03		
130335 [Filed]	ARTICLES COMPRISING AN ABRASION-RESISTANT RESINOUS SKIN INTEGRALLY BONDED WITH GRADED INTERFACE TO A RESINOUS CORE MATERIAL	United States	US	Provisional [Filed] S/N: 60/464517	22-Apr-03		
131068 [Filed]	WEAR AND CORROSION PREVENTION IN FIREARMS	United States	US	Provisional [Filed] S/N: 60/445609	7-Feb-03		
132255 [Filed]	AIRCRAFT ENGINE WEAR PARTS	United States	US	Provisional [Filed] S/N: 60/445632	7-Feb-03		
132270 [Filed]	CLIPPER BLADE SETS AND COMBS WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/445610	7-Feb-03		
132875 [Filed]	SELECTION OF DIAMONDS GRIT MORPHOLOGY AND SIZE DISTRIBUTION FOR CMP CONDITIONER APPLICATION	United States	US	Provisional [Filed]	8-Oct-03		
133139 [Filed]	IMPROVED WEAR PEROFRMANCE TOOLS FOR METAL, PLASTIC, CERAMIC AND COMPOSITE FORMING	United States	US	Provisional [Filed] S/N: 60/447808	14-Feb-03		
133140 [Filed]	PCD AND PCBN TOOL BLANKS WITH PREFIXED BRAZE ALLOY	United States	US	Provisional [Filed] S/N: 60/445613	7-Feb-03		
133141 [Filed]	COATINGS WITH HIGHLY TORTUOUS SURFACE TOPOGRAPHY FOR ABRASIVE/SUPERABRASIVE PARTICLES USED IN METALS/CERAMIC/POLYMER MATRIX COMPOSITES	United States	US	Provisional [Filed] S/N: 60/469285	8-May-03		
133615 [Filed]	IMPROVED TOOLS FOR MACHINING FIBER CEMENTS	United States	US	Provisional [Filed]	11-Mar-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US	Provisional [Filed] S/N: 60/470306	14-May-03		
133794 [Filed]	SUPERABRASIVE TOOLS PRESS-FIT INTO CARBIDE SUBSTRATES TO ELIMINATE HOT-BRAZING IN TOOL FABRICATION	United States	US		22-Oct-03		
133920 [Filed]	DRILL BITS, ROUTER BITS, PROFILE CUTTERS, FILES, PLANING AND SAW BLADES WITH IMPROVED WEAR RESISTANCE	United States	US	Provisional [Filed] S/N: 60/469287	9-May-03		
133975 [Filed]	METHOD TO IMPROVE TOOL INTEGRITY WHEN CUTTING STONE	United States	US	Provisional [Filed]	14-Aug-03		
135143 [Filed]	A METHOD OF MAKING ABRASIVE TOOLS FROM BI-MODAL DIAMOND OR CUBIC BORON NITRIDE POWDER	United States	US	Provisional [Filed] S/N: 60/467311	2-May-03		

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136255 [Filed]	SINTERED COMPACT FOR USE IN MACHINING VARIOUS CAST IRON MATERIALS	United States	US	Provisional [Filed]	3-Dec-03		
145361 [Filed]	COMPRESSION CONTAINER FOR POLYCRYSTALLINE WIRE DIE	United States	US	Provisional [Filed]	10-Dec-03		
60SD10 [Filed]	DIAMOND AND CBN ABRASIVE COMPACTS USING SIZE SELECTIVE ABRASIVE PA RTICLE LAYERS	United States	US	S/N: 219289 P/N: 4311490	7-Sep-88		
60SD147 [Filed]	RE-SINTERED BORON-RICH POLYCRYSTALLINE CUBIC BORON NITRIDE AND MET HOD FOR MAKING SAME	United States	US	S/N: 823893 P/N: 4673414	29-Jan-86		
60SD184 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD240 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 542081 P/N: 4525179	14-Oct-83		
60SD242 [Filed]	PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD245 [Filed]	MERGED WITH 60-SD-259 FOR FILING	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD24559 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS	United States	US	S/N: 818850 P/N: 4797326	14-Jan-86		
60SD246 [Filed]	GANG SAW FOR CUTTING BLOCKS OF STONE	United States	US	S/N: 515448 P/N: 4498450	20-Jul-83		
60SD249 [Filed]	SWEEP THROUGH PROCESS FOR MAKING POLYCRYSTALLINE COMPACTS	United States	US	S/N: 536221 P/N: 4518659	23-Sep-83		
60SD251 [Filed]	IMPROVED PROCESS FOR MAKING DIAMOND AND CUBIC BORON NITRIDE COMPACTS	United States	US	S/N: 552081 P/N: 4525179	14-Oct-83		
60SD254 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 06/920041 P/N: 4738689	16-Oct-86		
60SD256 [Filed]	POLYCRYSTALLINE SANDWICH COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/277875 P/N: 5009673	30-Nov-88		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 697668 P/N: 4810447	4-Feb-85		
60SD257 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 8491 P/N: 4832708	27-Jan-87		
60SD261 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 7/366943 P/N: 5043120	16-Jun-89		
60SD262 [Filed]	BRAZED COMPOSITE COMPACT IMPLEMENTS	United States	US	S/N: 624064 P/N: 4527998	25-Jun-84		
60SD303 [Filed]	REFRACTORY METAL OXIDE COATED ABRASIVES AND GRINDING WHEELS MADE THEREFROM	United States	US	S/N: 07/358728 P/N: 4951427	30-May-89		
60SD305 [Filed]	STUD-MOUNTED POLYCRYSTALLINE TOOTHED DIAMOND CUTTING BLANKS	United States	US	S/N: 7/192872 P/N: D317010	11-May-88		
60SD308 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 7/365268 P/N: 4931363	12-Jun-89		

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60SD30811 [Filed]	BRAZED THERMALLY-STABLE POLYCRYSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 158575 P/N: 4899922	22-Feb-88		
60SD317 [Filed]	COATED OXIDATION-RESISTANT POROUS ABRASIVE COMPACT AND METHOD FOR MAKING SAME	United States	US	S/N: 920041 P/N: 47386689	16-Oct-86		
60SD318 [Filed]	BONDING OF THERMALLY STABLE ABRASIVE COMPACTS TO CARBIDE SUPPORTS	United States	US	S/N: 07/158336 P/N: 4850523	22-Feb-88		
60SD327 [Filed]	SYSTEM FOR IMPROVED FLAW DETECTION IN POLYCRYSTALLINE DIAMOND	United States	US	S/N: 008491 P/N: 4832708	29-Jan-87		
60SD33 [Filed]	OPTICAL WINDOWS MADE OF POLYCRYSTALLINE ADAMANTANE BORON NITRIDE OR DIAMOND	United States	US	S/N: 488003 P/N: 4536442	2-May-83		
60SD332 [Filed]	METHOD OF MAKING DIAMOND TOOL	United States	US	S/N: 713966 P/N: 4661180	25-Mar-85		
60SD333 [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 153466 P/N: 4828582	3-Feb-88		
60SD333V [Filed]	POLYCRYSTALLINE ABRASIVE GRIT	United States	US	S/N: 793462 P/N: 4828582	1-Sep-88		
60SD358 [Filed]	PRODUCTS AND PROCESS FOR MAKING MULTIGRAIN ABRASIVE COMPACTS	United States	US	S/N: 07/669259 P/N: 5211726	14-Mar-91		
60SD364 [Filed]	MULTIGRAIN ABRASIVE PARTICLES	United States	US	S/N: 07/669124 P/N: 5106392	14-Mar-91		
60SD367 [Filed]	CHIP BREAKER FOR POLYCRYSTALLINE CBN AND DIAMOND COMPACTS	United States	US	S/N: 7/429661 P/N: 5026960	31-Oct-89		
60SD368 [Filed]	DIAMOND AND CUBIC BORON NITRIDE	United States	US	S/N: 156272 P/N: 4807402	12-Feb-88		
60SD389 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANKS	United States	US	S/N: 328347 P/N: D330206	24-Mar-89		
60SD390 [Filed]	RECIPROCATING POINT ROTARY DIAMOND	United States	US	S/N: 07/635082 P/N: 5172681	28-Dec-90		
60SD401 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332814 P/N: D325226	3-Apr-89		
60SD412 [Filed]	SAWBLADE SEGMENTS UTILIZING POLYCRYSTALLINE DIAMOND GRIT	United States	US	S/N: 262405 P/N: 4883500	25-Oct-88		
60SD419 [Filed]	SUPPORTED THERMALLY STABLE CUBIC BORON NITRIDE TOOLS BLANKS AND METHOD FOR MAKING THE SAME	United States	US	S/N: 7/394349 P/N: 4985050	15-Aug-89		
60SD428 [Filed]	DIAMOND COMPACTS FOR ROCK DRILLING AND MACHINING	United States	US	S/N: 7/420191 P/N: 5022894	12-Oct-89		
60SD437 [Filed]	METHOD FOR PRODUCING POLYCRYSTALLINE COMPACT TOOL BLANKS WITH FLAT CARBIDE SUPPORT/DIAMOND OR CBN INTERFACES	United States	US	S/N: 331928 P/N: 4954139	31-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 328348 P/N: D324527	24-Mar-89		
60SD439 [Filed]	STUD-MOUNTED POLYCRYSTALLINE DIAMOND CUTTING BLANK	United States	US	S/N: 7/328348 P/N: 324527	24-Mar-89		
60SD440 [Filed]	INTERLOCKING MOUNTED ABRASIVE COMPACTS	United States	US	S/N: 332828 P/N: D324056	3-Apr-89		
60SD455 [Filed]	CBN/CBN COMPOSITE MASSES AND THEIR PREPARATION	United States	US	S/N: 7/630916 P/N: 5106792	20-Dec-90		
60SD458 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES FOR SINTERED METAL BONDED TOOLS	United States	US	S/N: 07/857132 P/N: 5250086	25-Mar-92		

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60SD461 [Filed]	BRAZED THERMALLY-STABLE POLYCRSTALLINE DIAMOND COMPACT WORKPIECES AND THEIR FABRICATION	United States	US	S/N: 365268 P/N: 4931363	12-Jun-89		
60SD469 [Filed]	POLYCRYSTALLINE CVD DIAMOND SUBSTRATE FOR SINGLE CRYSTAL EPITAXIAL GROWTH OF SEMICONDUCTORS FORMERLY	United States	US	S/N: 07/479486 P/N: 4981818	13-Feb-90		
60SD493 [Filed]	CVD DIAMOND COATED ANNULUS COMPONENTS AND THEIR METHOD OF FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/563367 P/N: 5096736	7-Aug-90		
60SD498 [Filed]	CVD DIAMOND FOR COATING TWIST DRILLS	United States	US	S/N: 07/929239 P/N: 5256206	14-Aug-92		
60SD499 [Filed]	CVD DIAMOND COATED TWIST DRILLS	United States	US	S/N: 07/555879 P/N: 5022801	18-Jul-90		
60SD504 [Filed]	USING THERMALLY-STABLE DIAMOND OR CBN COMPACTS AS TIPS FOR ROTARY DRILLS	United States	US	S/N: 07/577379 P/N: 5273557	4-Sep-90		
60SD506 [Filed]	ISOTOPICALLY PURE SINGLE CRYSTAL EPITAXIAL DIAMOND FILMS AND THEIR PREPARATION	United States	US	S/N: 07/547651 P/N: 5360479	2-Jul-90		
60SD518 [Filed]	THERMALLY STABLE DENSE ELECTRICALLY CONDUCTIVE DIAMOND COMPACTS	United States	US	S/N: 07/773461 P/N: 5266236	9-Oct-91		
60SD528 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD567 [Filed]	CHEMICALLY BONDED ADHERENT COATING FOR ABRASIVE COMPACTS AND METHOD FOR MAKING SAME	United States	US	S/N: 07/710725 P/N: 5173091	4-Jun-91		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD576 [Filed]	SMOOTH SURFACE CVD DIAMOND FILMS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 08/220946 P/N: 5523121	31-Mar-94		
60SD577 [Filed]	CARBON FLUORIDE COMPOSITIONS	United States	US	S/N: 08/073991 P/N: 5380557	3-Jun-93		
60SD578 [Filed]	METHOD FOR MAKING SMOOTH SUBSTRATE MANDRELS	United States	US	S/N: 07/815478 P/N: 5176803	4-Mar-92		
60SD581 [Filed]	METHOD FOR PRODUCING UNIFORM CYLINDRICAL TUBES OF CVD DIAMOND	United States	US	S/N: 08/138888 P/N: 5387447	19-Oct-93		
60SD582 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD583 [Filed]	COATING FOR IMPROVED RETENTION OF CBN IN VITREOUS BOND MATRICES	United States	US	S/N: 08/005951 P/N: 5300129	19-Jan-93		
60SD584 [Filed]	DUAL-COATED DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/762999 P/N: 5143523	20-Sep-91		
60SD615 [Filed]	METHOD FOR CONTROLLING THE PARTICLE SIZE DISTRIBUTION IN THE PRODU CTION OF MULTICRYSTALLINE CUBIC BORON NITR IDE	United States	US	S/N: 07/995229 P/N: 5985228	22-Dec-92		
60SD628 [Filed]	DIAMOND PELLETS AND SAW BLADE SEGMENTS MADE THEREWITH	United States	US	S/N: 07/857192 P/N: 5405573	4-May-92		
60SD633 [Filed]	MULTI-LAYER METAL COATED DIAMOND ABRASIVES WITH AN ELECTROLESSLY DEPOSITED METAL LAYER	United States	US	S/N: 07/857139 P/N: 5232469	25-Mar-92		

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60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/322841 P/N: 5510193	13-Oct-94		
60SD643 [Filed]	SUPPORTED POYCRYSTALLINE DIAMOND COMPACT HAVING A CUBIC BORON NITR IDE INTERLAYER FOR IMPROVED PHYSICAL PROPE RTIES	United States	US	S/N: 08/595715 P/N: 5603070	2-Feb-96		
60SD645 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD647 [Filed]	FINE GRAIN DIAMOND WORKPIECES	United States	US	S/N: 07/967461 P/N: 5439492	28-Oct-92		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/095631 P/N: 5484330	21-Jul-93		
60SD652 [Filed]	ABRASIVE TOOL INSERT SEE CIP 60SD00658	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD653 [Filed]	REDUCTION OF STRESSES IN THE POLYCRYSTALLINE ABRASIVE LAYER OF A C OMPOSITE COMPACT IN THE IN SITU BONDED CAR BIDE/CARBIDE SUPPORT	United States	US	S/N: 08/489877 P/N: 5560754	13-Jun-95		
60SD658 [Filed]	ABRASIVE TOOL INSERT SEE CIP	United States	US	S/N: 08/105523 P/N: 5494477	11-Aug-93		
60SD660 [Filed]	PROCESS FOR PREPARING POLYCRYSTALLINE CBN CERAMIC MASSES AND RESUL TING PRODUCT	United States	US	S/N: 07/985500 P/N: 5320988	1-Dec-92		
60SD662 [Filed]	METHOD OF SEPARATION OF PIECES FROM SUPER HARD MATERIAL BY PARTIAL LASER CUT AND PRESSURE CLEAVAGE	United States	US	S/N: 08/060459 P/N: 5387776	11-May-93		
60SD664 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD665 [Filed]	MEASURING THE STRENGTH OF ABRASIVE GRAINS	United States	US	S/N: 08/016638 P/N: 5392633	12-Feb-93		
60SD669 [Filed]	PROCESS FOR MAKING COATED ABRASIVES FOR GRINDING WHEELS	United States	US	S/N: 08/032750 P/N: 5306318	17-Mar-93		
60SD690 [Filed]	MULTIPLE GRAINED DIAMOND WIRE DIE	United States	US	S/N: 08/143802 P/N: 5361621	27-Oct-93		
60SD691 [Filed]	OPTICALLY IMPROVED DIAMOND WIRE DIE	United States	US	S/N: 08/148803 P/N: 5465603	5-Nov-93		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 08/571312 P/N: 5855996	12-Dec-95		
60SD693 [Filed]	ABRASIVE COMPACT WITH IMPROVED PROPERTIES	United States	US	S/N: 09/087776 P/N: 6132675	29-May-98		
60SD694 [Filed]	DIAMOND WIRE DIE	United States	US	S/N: 08/121014 P/N: 5363687	14-Sep-93		
60SD696 [Filed]	ABRASIVE TOOL INSERT	United States	US	S/N: 08/271307 P/N: 5486137	6-Jul-94		
60SD698 [Filed]	CVD DIAMOND COATING ANNULUS COMPONENTS AND METHOD OF THEIR FABRICATION	United States	US	S/N: 08/127964 P/N: 5508071	28-Sep-93		
60SD701 [Filed]	DIAMOND WIRE DIE WITH POSITIONED OPENING	United States	US	S/N: 08/144168 P/N: 5377522	27-Oct-93		
60SD708 [Filed]	A METHOD FOR MANUFACTURING A DIAMOND ARTICLE	United States	US	S/N: 08/310449 P/N: 5529805	22-Sep-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/286076 P/N: 5500248	4-Aug-94		
60SD709 [Filed]	FABRICATION OF AIR BRAZABLE DIAMOND TOOL INSERTS AND INSERTS FABRI CATED THEREBY	United States	US	S/N: 08/583360 P/N: 5647878	5-Jan-96		

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60SD712 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/238543 P/N: 5451430	5-May-94		
60SD713 [Filed]	METHOD FOR ENHANCING THE TOUGHNESS OF CVD DIAMOND	United States	US	S/N: 08/654815 P/N: 5672395	29-May-96		
60SD714 [Filed]	ANNULAR DIAMOND BODIES	United States	US	S/N: 08/311658 P/N: 5551277	23-Sep-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/239156 P/N: 5512235	6-May-94		
60SD715 [Filed]	SUPPORTED POLYCRYSTALLINE COMPACTS HAVING IMPROVED PHYSICAL PROPER TIES AND METHOD FOR MAKING SAME	United States	US	S/N: 08/616997 P/N: 5773140	14-Mar-96		
60SD721 [Filed]	WIRE DRAWING DIE HAVING IMPROVED PHYSICAL PROPERTIES NO DIVISIONAL DUE PER GLL	United States	US	S/N: 08/412050 P/N: 5660075	28-Mar-95		
60SD726 [Filed]	A FINE GRAIN DIAMOND TOOL AND METHOD OF MANUFACTURE	United States	US	S/N: 08/551593 P/N: 5660936	1-Nov-95		
60SD728 [Filed]	PREPARATION OF THIN FREE-STANDING DIAMOND FILMS	United States	US	S/N: 08/369047 P/N: 5490963	5-Jan-95		
60SD731 [Filed]	CLASSIFYING AND SORTING CRYSTALLINE OBJECTS	United States	US	S/N: 08/400556 P/N: 5544254	8-Mar-95		
60SD732 [Filed]	MULTILAYER CVD DIAMOND FILMS	United States	US	S/N: 08/400555 P/N: 5491002	8-Mar-95		
60SD745 [Filed]	METHOD FOR PRODUCING UNIFORMLY HIGH QUALITY ABRASIVE COMPACTS	United States	US	S/N: 08/555672 P/N: 5669944	13-Nov-95		
60SD749 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH REDUCED FAILURE DURING BRAZING	United States	US	S/N: 08/975028 P/N: 6042463	20-Nov-97		
60SD750 [Filed]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT NO DIV DUE PER EPA 5/1/97	United States	US	S/N: 08/591879 P/N: 5662720	26-Jan-96		
60SD752 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT (PDC) CUTTER WITH IMPROVED CUTTING CAPABILITY	United States	US	S/N: 08/975429 P/N: 6045440	20-Nov-97		
60SD753 [Filed]	POLYCRYSTALLINE DIAMOND COMPACT CUTTER WITH IMPROVED CUTTING BY PREVENTING CHIP BUILD UP	United States	US	S/N: 09/131460 P/N: 6196910	10-Aug-98		
60SD760A [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT	United States	US	S/N: 08/777213 P/N: 5848657	27-Dec-96		
60SD768 [Filed]	AN IMPROVED ABRASIVE CUTTING ELEMENT AND DRILL BIT	United States	US	S/N: 08/611896 P/N: 5743346	6-Mar-96		
60SD769 [Filed]	POLYCRYSTALLINE DIAMOND CUTTING ELEMENT WITH DIAMOND RIDGE PATTERN	United States	US	S/N: 08/777222 P/N: 5829541	27-Dec-96		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 08/779417	7-Jan-97		
60SD772 [Filed]	COATED CBN POLYCRYSTALLINE SUPERABRASIVE TOOLS	United States	US	S/N: 10/411471	8-Apr-03		
60SD774 [Filed]	METHOD FOR PRODUCING CUBIC BORON NITRIDE USING MELAMINE AS A CATALYST	United States	US	S/N: 09/072144 P/N: 5869015	4-May-98		
60SD784 [Filed]	SYNTHETIC GASKET MATERIAL FOR USE IN HIGH PRESSURE PRESSES TRANS FM/MEGADIAMOND	United States	US	S/N: 08/874769 P/N: 5858525	13-Jun-97		

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60SD785 [Filed]	THERMALLY-DIFFUSED BORON DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/561128 P/N: 6322891	28-Apr-00		
60SD787 [Filed]	SUPERABRASIVE CUTTING ELEMENT WITH ENHANCED STIFFNESS, THERMAL CON DUCTIVITY AND CUTTING EFFICIENCY	United States	US	S/N: 08/783171 P/N: 6009963	14-Jan-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 08/950004 P/N: 5957005	14-Oct-97		
60SD788 [Filed]	WIRE DRAWING DIE WITH NON-CYLINDRICAL INTERFACE CONFIGURATION FOR REDUCING STRESSES	United States	US	S/N: 09/358271 P/N: 6314836	21-Jul-99		
60SD794 [Filed]	AXISYMMETRIC CUTTING ELEMENT	United States	US	S/N: 09/492095 P/N: 6260640	27-Jan-00		
60SD795 [Filed]	SHAPED POLYCRYSTALLINE CUTTER ELEMENTS	United States	US	S/N: 09/072471 P/N: 6102143	4-May-98		
60SD796 [Filed]	TITANIUM CHROMIUM ALLOY COATED DIAMOND CRYSTALS FOR USE IN SAW BLA DE SEGMENTS AND METHOD FOR THEIR PRODUCTIO N	United States	US	S/N: 09/570957 P/N: 6319608	15-May-00		
60SD802 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORLESS AND FANCY COLORED DIAMONDS	United States	US	S/N: 10/338136	8-Jan-03		
60SD805 [Filed]	HIGH PRESSURE APPARATUS HAVING TRANSITION SLOPE BINDING RING THAT MITIGATES TENSILE STRESSES AND CORRESPONDI NG METHOD	United States	US	S/N: 09/740777 P/N: 6375446	19-Dec-00		
60SD806 [Filed]	LOW OXYGEN CUBIC BORON NITRIDE	United States	US	S/N: 10/001573	2-Nov-01		
60SD811 [Filed]	CRYSTAL MIXING FOR LOW POWER GRINDING	United States	US	S/N: 09/988244	16-Nov-01		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 60/139654	17-Jun-99		
60SD812 [Filed]	METHOD AND APPARATUS FOR CUTTING GRANITE	United States	US	S/N: 10/014547	14-Dec-01		
60SD817 [Filed]	HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORED DIAMONDS	United States	US	S/N: 10/069362	25-Aug-00		
60SD820 [Filed]	SURFACE MODIFICATION OF COATED ABRASIVES TO ENHANCE THEIR ADHESION IN RESIN BOND TOOLS	United States	US	S/N: 09/901159	9-Jul-01		
60SD827 [Filed]	ABRASIVE TOOL INSERTS AND THEIR PRODUCTION	United States	US	S/N: 09/845540 P/N: 6315652	30-Apr-01		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 60/224485	11-Aug-00		
60SD831 [Filed]	HIGH PRESSURE AND HIGH TEMPERATURE PRODUCTION OF DIAMONDS	United States	US	S/N: 10/344249	11-Feb-03		
60SD838 [Filed]	SILVER-COATED ABRASIVES, TOOLS CONTAINING SILVER-COATED ABRASIVES, AND APPLICATIONS OF THESE TOOLS	United States	US	S/N: 09/776141 P/N: 6666753	2-Feb-01		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/737667	15-Dec-00		
60SD839 [Filed]	JADEITE AND ITS PRODUCTION	United States	US	S/N: 09/799192	5-Mar-01		
60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 09/935957	23-Aug-01		

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60SD845 [Filed]	BORON DOPED BLUE DIAMOND AND ITS PRODUCTION	United States	US	S/N: 10/262784	2-Oct-02		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 09/987863 P/N: 6475254	16-Nov-01		
60SD851 [Filed]	FUNCTIONALLY GRADED COATINGS FOR ABRASIVE PARTICLES AND USE THEREO FIN VITREOUS MATRIX COMPOSITES	United States	US	S/N: 10/174914 P/N: 6596040	19-Jun-02		
60SD852 [Filed]	HIGH PRESSURE PRODUCTION OF PEROVSKITES	United States	US	S/N: 09/931312	16-Aug-01		
RD14877 [Filed]	SINTERED POLYCRYSTALLINE DIAMOND COMPACT CONSTRUCTION WITH INTEGRA L HEAT SINK	United States	US	S/N: 652242 P/N: 4605343	20-Sep-84		
RD16334 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 830414 P/N: 4690691	13-Feb-86		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 07/332914 P/N: 5261959	4-Apr-89		
RD17340 [Filed]	DIAMOND CRYSTAL GROWTH PROCESS	United States	US	S/N: 08/150633 P/N: 5516554	10-Nov-93		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 48176 P/N: 4797138	11-May-87		
RD18037 [Filed]	POLYCRYSTALLINE DIAMOND AND CBN CUTTING TOOLS	United States	US	S/N: 07/048176 P/N: 4797138	11-May-87		
RD18116 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 07/744815 P/N: 5310447	12-Aug-91		
RD18402 [Filed]	EXCIMER LASER PATTERNING OF A NOVEL RESIST	United States	US	S/N: 224416 P/N: 4842677	26-Jul-88		
RD18693 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUB STRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/407179 P/N: 5110579	14-Sep-89		
RD19369 [Filed]	TRANSPARENT DIAMOND FILMS AND METHOD FOR MAKING	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD19567 [Filed]	FREE STANDING DIAMOND SHEET AND METHOD AND APPARATUS FOR MAKING SA ME	United States	US	S/N: 07/537963 P/N: 5464071	13-Jun-90		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/163608 P/N: 5419276	6-Dec-93		
RD20142 [Filed]	SINGLE-CRYSTAL DIAMOND OF VERY HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/368732 P/N: 5540904	4-Jan-95		
RD20790 [Filed]	APPARATUS FOR PRODUCING DIAMONDS BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD20983 [Inactivated]	ARTIFICIAL POLYMER LATICES IN CORE-SHELL FORM AND METHOD OF PREPARATION	United States	US	S/N: 07/980,444 P/N: 5356955	23-Nov-93		
RD21018 [Filed]	METHOD FOR IMPROVING ADHESION OF SYNTHETIC DIAMOND COATINGS TO SUBSTRATES	United States	US	S/N: 07/653556 P/N: 5190823	11-Feb-91		
RD21033 [Filed]	IMPROVED METHOD OF APPLYING METAL COATINGS ON DIAMOND AND ARTICLES MADE THEREFROM	United States	US	S/N: 07/722575 P/N: 5190796	27-Jun-91		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
RD21034 [Inactivated]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD21356 [Filed]	METHOD FOR PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION	United States	US	S/N: 07/845992 P/N: 5175929	4-Mar-92		
RD21493 [Filed]	METHOD OF APPLYING METAL COATING ON CUBIC ORON NITRIDE AND ARTICLE S MADE THEREFROM	United States	US	S/N: 07/738758 P/N: 5188643	1-Aug-91		
RD21661 [Filed]	PREHEATER FOR CVD DIAMOND REACTOR	United States	US	S/N: 08/306077 P/N: 5479874	14-Sep-94		
RD21796 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		
RD22021 [Filed]	SUBSTANTIALLY TRANSPARENT FREE STANDING DIAMOND FILMS	United States	US	S/N: 07/859753 P/N: 5273731	30-Mar-92		
RD22055 [Filed]	METHOD FOR DETERMINING THICKNESS OF CHEMICAL VAPOR DEPOSITED LAYERS	United States	US	S/N: 07/991798 P/N: 5300313	16-Dec-92		
RD22294 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD22486 [Filed]	APPARATUS FOR PRODUCING DIAMOND BY CHEMICAL VAPOR DEPOSITION AND ARTICLES PRODUCED THEREFROM	United States	US	S/N: 07/948077 P/N: 5204145	21-Sep-92		
RD22514 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING GRAPHITE SUBSTRATE HOLDERS	United States	US	S/N: 08/096392 P/N: 5391229	26-Jul-93		
RD22530 [Filed]	APPARATUS FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND INCLUDING THERM AL SPREADER	United States	US	S/N: 08/172797 P/N: 5397396	27-Dec-93		
RD22721 [Filed]	POLYCRYSTALLINE CARBON CONVERSION	United States	US	S/N: 09/206721 P/N: 6126741	7-Dec-98		
RD22800 [Filed]	TUNGSTEN METALIZATION OF CVD DIAMOND	United States	US	S/N: 08/100406 P/N: 5346719	2-Aug-93		
RD22976 [Filed]	METHOD FOR MAKING HIGH THERMAL CONDUCTING DIAMOND	United States	US	S/N: 08/316995 P/N: 5445106	3-Oct-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD22980 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD23162 [Filed]	METHOD OF PRODUCING ARTICLES BY CHEMICAL VAPOR DEPOSITION AND THE SUPPORT MANDRELS USED THEREIN	United States	US	S/N: 08/119448 P/N: 5869133	9-Sep-93		
RD23356 [Filed]	CHEMICAL VAPOR DEPOSITION OF POLYCRYSTALLINE DIAMOND WITH OR IENTATION AND GROWTH FACETS	United States	US	S/N: 08/264268 P/N: 5437891	23-Jun-94		
RD23427 [Filed]	PROCESS FOR MAKING METALLIZED VIAS IN DIAMOND SUBSTRATES	United States	US	S/N: 08/188877 P/N: 5382758	31-Jan-94		
RD23481 [Filed]	DIAMOND OPTICAL PLATE BEAMSPLITTER	United States	US	S/N: 08/538656 P/N: 5706135	3-Oct-95		
RD23502 [Filed]	APPARATUS FOR ANNEALING DIAMOND WATER JET MIXING TUBES	United States	US	S/N: 08/267181 P/N: 5468934	15-Jun-94		
RD23503 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/261358 P/N: 5424096	13-Jun-94		
RD23511 [Filed]	ARTICLES HAVING THERMAL CONDUCTORS OF GRAPHITE	United States	US	S/N: 08/262796 P/N: 5494753	20-Jun-94		
RD23716 [Filed]	SUPPRESSION OF GRAPHITE FORMATION DURING LASER ETCHING OF DIAMOND	United States	US	S/N: 08/248896 P/N: 5419798	25-May-94		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
RD23717 [Filed]	ULTRAFAST OPTICAL MODULATOR	United States	US	S/N: 08/605417 P/N: 5659415	22-Feb-96		
RD23819 [Filed]	FABRICATION OF BRAZABLE IN AIR TOOL INSERTS AND INSERTS FABRICATED THEREBY	United States	US	S/N: 08/350572 P/N: 5626909	7-Dec-94		
RD23927 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499238 P/N: 5634369	7-Jul-95		
RD23948 [Filed]	DIAMOND FILM STRUCTURE WITH HIGH THERMAL CONDUCTIVITY	United States	US	S/N: 08/316998 P/N: 5525815	3-Oct-94		
RD24002 [Filed]	SYNTHETIC DIAMOND PRODUCT	United States	US	S/N: 08/411181 P/N: 5503104	27-Mar-95		
RD24111 [Filed]	APPARATUS AND METHOD FOR CHEMICAL VAPOR DEPOSITION OF DIAMOND	United States	US	S/N: 08/364568 P/N: 5437728	27-Dec-94		
RD24416 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499237 P/N: 5636545	7-Jul-95		
RD24447 [Filed]	COMPOSITE DIAMOND WIRE DIE	United States	US	S/N: 08/499502 P/N: 5634370	7-Jul-95		
RD24450 [Filed]	ELECTRONIC APPARATUS WITH COMPLIANT METAL CHIP-SUBSTRATE BONDING LAYER(S)	United States	US	S/N: 08/457551 P/N: 5567985	1-Jun-95		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/201384 P/N: 6152977	30-Nov-98		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING SAME	United States	US	S/N: 09/484389 P/N: 6350191	14-Jan-00		
RD25160 [Filed]	SURFACE-FUNCTIONALIZED DIAMOND CRYSTALS AND METHOD FOR PRODUCING S AME	United States	US	S/N: 09/484392 P/N: 6406776	14-Jan-00		
RD25308 [Filed]	SURFACE ENRICHED DIAMOND AND METHOD OF MAKING	United States	US	S/N: 09/783441	14-Feb-01		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/472104 P/N: 6258721	27-Dec-99		
RD27003 [Filed]	DIAMOND MICRO SLURRY FOR CHEMICAL-MECHANICAL PLANARIZATION OF SEMI CONDUCTOR WAFERS	United States	US	S/N: 09/591189 P/N: 6242351	9-Jun-00		
RD27642 [Filed]	METHOD OF DETECTION OF NATURAL DIAMONDS THAT HAVE BEEN PROCESSED A T HIGH PRESSURE AND HIGH TEMPERATURES	United States	US	S/N: 09/430477 P/N: 6377340	29-Oct-99		
RD27888 [Filed]	FUNCTIONALIZED DIAMONDS WITH ENHANCED RETENTION IN RESIN BONDS, REACTIONS AND METHODS FOR PRODUCING SAME, AND ABRASIVES USING FUNCTIONALIZED DIAMONDS	United States	US	S/N: 09/576794 P/N: 6372002	23-May-00		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 09/793312 P/N: 6541115	26-Feb-01		
RD28183 [Filed]	METAL-INFILTRATED POLYCRYSTALLINE DIAMOND COMPOSITE TOOL FORMED FR OM COATED DIAMOND PARTICLES	United States	US	S/N: 10/255431	26-Sep-02		
RD28271 [Filed]	ABRASIVE DIAMOND COMPOSITE AND METHOD OF MAKING THEREOF	United States	US	S/N: 09/729525	4-Dec-00		
134047 [Filed]	METHOD TO STABILIZE FRAME SAW BLADES DURING CUT INITIATION	United States	US	134047 -1 Provisional [Filed] S/N 60/495,148	14-Aug-03		

Docket Number	Title	Filing Country	Country Code	Filing No./Type/SN/PN	Filing Date	Agent	Comments
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH DISCRETE PARTICLE SIZE AREAS	United States	US	[Issued] S/N: 09/167,196 P/N: 6,187,068	[Awaiting] 10/6/98		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT AND THERMAL STABILITY	United States	US	[Issued] S/N: 08/523,868 P/N: 5,645,617	[Awaiting] 9/6/95		
[Awaiting]	COMPOSITE POLYCRYSTALLINE COMPACT WITH IMPROVED FRACTURE AND DELAMINATION RESISTANCE	United States	US	[Issued] S/N: 08/415,693 P/N: 5,564,511	[Awaiting] 5/15/95		
[Awaiting]	HIGH PRESSURE/HIGH TEMPERATURE PISTON-CYLINDER APPARATUS	United States	US	[Issued] S/N: 07/792,716 P/N: 5,244,368	[Awaiting] 11/15/91		
[Awaiting]	HIGH PRESSURE REACTION VESSEL	United States	US	[Issued] S/N: 07/826,809 P/N: 5,236,674	[Awaiting] 1/28/92		
[Awaiting]	MODIFIED END ASSEMBLY FOR HIGH PRESSURE, HIGH TEMPERATURE REACTION VESSELS	United States	US	[Issued] S/N: 07/660,332 P/N: 5,190,734	[Awaiting] 2/22/91		
[Awaiting]	HIGH STRENGTH COMPOSITE COMPONENT AND METHOD OF FABRICATION	United States	US	[Issued] S/N: 07/153,725 P/N: 5,032,147	[Awaiting] 2/8/88		
[Awaiting]	COMPOSITE POLYCRYSTALLINE DIAMOND COMPACT WITH IMPROVED IMPACT RESISTANCE	United States	US	[Issued] S/N: 07/390,208 P/N: 5,011,515	[Awaiting] 8/7/89		
[Awaiting]	COMPOSITE COMPACT WITH A MORE THERMALLY STABLE CUTTING EDGE AND METHOD OF MANUFACTURING THE SAME	United States	US	[Issued] S/N: 07/390,204 P/N: 5,011,509	[Awaiting] 8/7/89		
[Awaiting]	COMPOSITE ABRASIVE COMPACT HAVING HIGH THERMAL STABILITY AND TRANSVERSE RUPTURE STRENGTH	United States	US	[Issued] S/N: 07/151,942 P/N: 4,871,377	[Awaiting] 2/3/88		
[Awaiting]	MATRIX CUTTER	United States	US	[Filed] S/N: 10/183,098	[Awaiting]		
[Awaiting]	ENHANCED METHOD FOR MAKING CVD DIAMOND	United States	US	[Filed] S/N: 10/161,266	[Awaiting] 6/3/02		

Posted on: 02/01/2003

Understanding Color Communicaton

How would you describe the color of this rose? Would you say it's yellow, sort of le maybe a bright canary yellow?

Your perception and interpretation of color are highly subjective. Eye fatigue, age physiological factors can influence your color perception.

But even without such physical considerations, each observer interprets color bas references. Each person also verbally defines an object's color differently.

As a result, objectively communicating a particular color to someone without some standard is difficult. There also must be a way to compare one color to the next wi

The solution is a measuring instrument that explicitly identifies a color. That is, an that differentiates a color from all others and assigns it a numeric value.

Ways to Measure Color

Today, the most commonly used instruments for measuring color are spectrophot Spectro technology measures reflected or transmitted light at many points on the spectrum, which results in a curve. Since the curve of each color is as unique as a fingerprint, the curve is an excellent tool for identifying, specifying and matching co

The instrumentation and communication of color data is as important as the color Throughout the supply chain, different suppliers may use different processes and color formulation and quality assurance, making compatibility an essential compon products are designed for integration and compatibility throughout the supply chai example, a large installation may use integrated, networked color formulation and assurance software, such as the Color(r) Master and several sphere instruments t shop. A small supplier with a QA-Master I installed on a single computer and one spectrophotometer will be compatible with the larger installation.

The following offers an understanding of which instrument is the best choice for sp applications.

Spherical

Spherically based instruments have played a major roll in formulation systems for years. Most are capable of including the "specular component" (gloss) while meas opening a small trap door in the sphere, the specular component is excluded from measurement. In most cases, databases for color formulation are more accurate w

component is a part of the measurement. Spherical instruments are also the instru choice when the sample is textured, rough, or irregular or approaches the brillianc surface mirror. Textile manufacturers, makers of roofing tiles or acoustic ceiling m all likely select spheres as the right tool for the job.

0/45 (or 45/0)

No instrument "sees" color more like the human eye than the 0/45. This simply is viewer does everything in his or her power to exclude the specular component (glo judging color. When we look at pictures in a glossy magazine, we arrange ourselv gloss does not reflect back to the eye. A 0/45 instrument, more effectively than an remove gloss from the measurement and measure the appearance of the sample human eye would see it.

Multi-Angle

In the past 10 or so years, carmakers have experimented with special effect colors such as mica, pearlescent materials, ground up seashells, microscopically coated pigments and interference pigments are used to produce different colors at differe view. Large and expensive goniometers were traditionally used to measure these battery-powered, hand-held, multi-angle instrument was introduced. X-Rite portab instruments are used by most automakers and their colorant supply chain worldwi

Colorimeter

Colorimeters are not spectrophotometers. Colorimeters are tristimulus (three-filter that make use of red, green and blue filters that emulate the response of the huma and color. In some quality-control applications, these tools can be the least expen Colorimeters cannot compensate for metamerism (a shift in the appearance of a s the light used to illuminate the surface). As colorimeters use a single type of light (incandescent or pulsed xenon) and because they do not record the spectral reflec media, they cannot predict this shift. Spectrophotometers can compensate for this them a better choice for accurate, repeatable color measurement.

Attributes of Color

Each color has its own distinct appearance, based on three elements: hue, chrom (lightness). By describing a color using these three attributes, you can accurately particular color and distinguish it from any other.

Hue

When asked to identify the color of an object, you'll most likely speak first of its hue. Quite simply, hue is how we perceive an object's color - red, orange, green, blue, etc. The color wheel in Figure 1 shows the continuum of color from one hue to the next. As the wheel illustrates, if you were to mix blue and green paints, you would get blue-green. Add yellow to green for yellow-green, and so on.

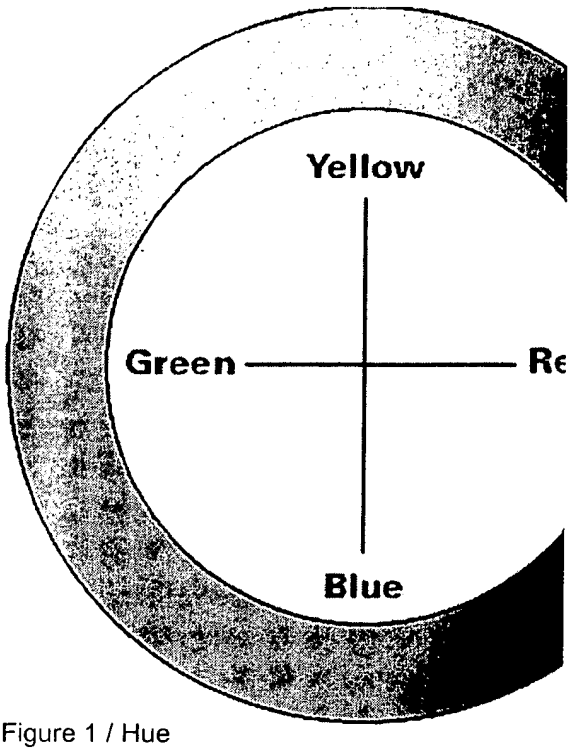

Figure 1 / Hue

Chroma

Chroma describes the vividness or dullness of a color - in other words, how close the color is to either gray or the pure hue. For example, think of the appearance of a tomato and a radish. The red of the tomato is vivid, while the radish appears duller.

Figure 2 shows how chroma changes as we move from center to the perimeter. Colors in the center are gray (dull) and become more saturated (vivid) as they move toward the perimeter. Chroma also is known as saturation.

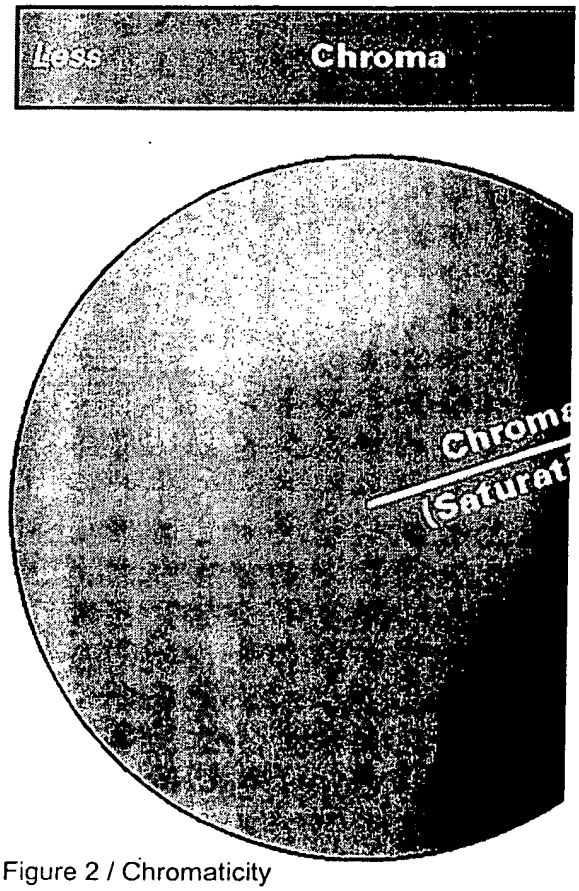

Figure 2 / Chromaticity

Lightness

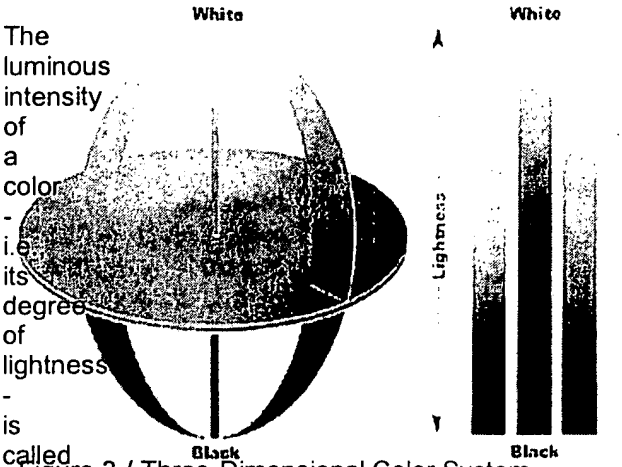

Figure 3 / Three-Dimensional Color System Depicting Lightness

The luminous intensity of a color - i.e. its degree of lightness - is called its value. Colors can be classified as light or dark when comparing their value.

For example, when a tomato and a radish are placed side by side, the red of the t to be much lighter. In contrast, the radish has a darker red value. In Figure 3, the v lightness, characteristic is represented on the vertical axis.

Scales for Measuring Color
The Munsell Scale

In 1905, artist Albert H. Munsell originated a color ordering system - or color scale - that is still used today. The Munsell System of Color Notation is significant from a historical perspective because it's based on human perception. Moreover, it was devised before instrumentation was available for measuring and specifying color. The Munsell System assigns numerical values to the three properties of color: hue, value and chroma. Adjacent color samples represent equal intervals of visual perception.

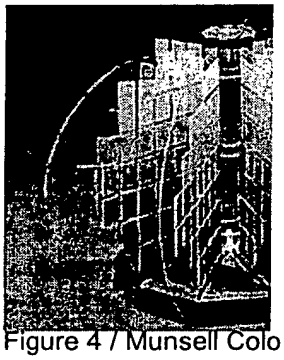
Figure 4 / Munsell Colo

Figure 4 depicts the Munsell Color Tree, which provides physical samples for judging visual color. Today's color systems rely on instrumen mathematics to help us judge color.

Three things are necessary to see color: a light source (illuminant), an object (sam observer/processor.

As humans, we see color because our eyes process the interaction of light hitting What if we replace our eyes with an instrument - can it see and record the same c differences that our eyes detect?

CIE Color Systems

The CIE, or Commission Internationale de l'Eclairage (translated as the International Commission on Illumination), is the body responsible for international recommendations for photometry and

colorimetry. In 1931 the CIE standardized color order systems by specifying the light source (or illuminants), the observer and the methodology used to derive values for describing color.

The CIE Color Systems use three coordinates to locate a color in a color space. These color spaces include CIE XYZ, CIE L*a*b* and CIE L*C*h?. To obtain these values, we must understand how they are calculated.

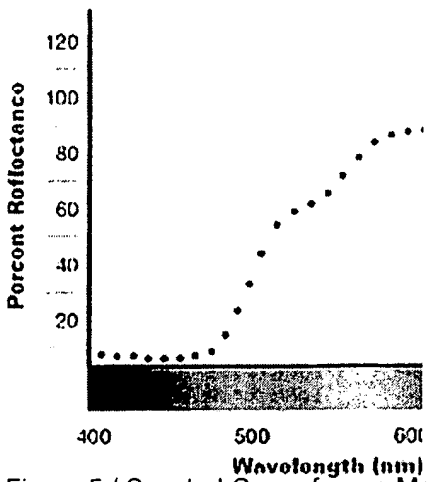

Figure 5 / Spectral Curve from a Me Sample

As stated, our eyes need three things to see color: a light source, an object and an observer/processor. The same must be true for instruments to see color. Color measurement instruments receive color the same way our eyes do - by gathering and filtering the wavelengths of light reflected from an object. The instrument perceive light wavelengths as numeric values. These values are recorded as points across spectrum and are called spectral data. Spectral data is represented as a spectral curve is the color's fingerprint (see Figure 5).

Once we obtain a color's reflectance curve, we can apply mathematics to map the color space. To do this, we take the reflectance curve and multiply the data by a C illuminant. The illuminant is a graphical representation of the light source under wh samples are viewed. Each light source has a power distribution that affects how w Examples of different illuminants are A - incandescent, D65 - daylight (see Figure fluorescent.

We multiply the result of this calculation by the CIE standard observer. The CIE co work in 1931 and 1964 to derive the concept of a standard observer, which is bas average human response to wavelengths of light (see Figure 7).

In short, the standard observer represents how an average person sees color acro spectrum. Once these values are calculated, we convert the data into the tristimul XYZ (see Figure 8). These values can now identify a color numerically.

Chromaticity Values

Tristimulus values, unfortunately, have limited use as color specifications because they correlate poorly with visual attributes. While Y relates to value (lightness), X and Z do not correlate to hue and chroma.

As a result, when the 1931 CIE standard observer was established, the commission recommended using the chromaticity coordinates xyz. These coordinates are used to form the chromaticity diagram in Figure 9. The notation Yxy specifies colors by identifying value (Y) and the color as viewed in the chromaticity diagram (x,y).

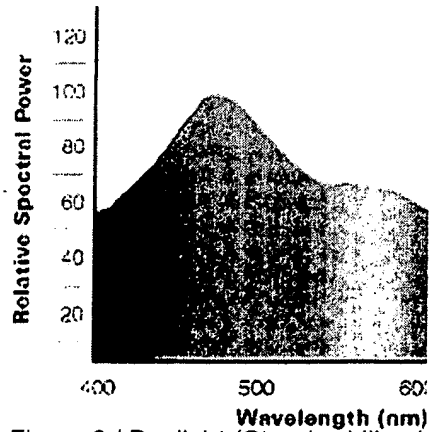

Figure 6 / Daylight (Standard Illumin D65/10_)

As Figure 10 shows, hue is represented at all points around the perimeter of the chromaticity diagram. Chroma, or saturation

represented by a movement from the central white (neutral) area out toward the d perimeter, where 100% saturation equals pure hue.

Expressing Colors Numerically

To overcome the limitations of chromaticity diagrams like Yxy, the CIE recommended two alternate, uniform color scales: CIE 1976 (L*a*b*) or CIELAB, and CIELCH (L*C*h?).

These color scales are based on the opponent-colors theory of color vision, which says that two colors cannot be both green and red at the same time, nor blue and yellow at the same time. As a result, single values can be used to describe the red/green and the yellow/blue attributes.

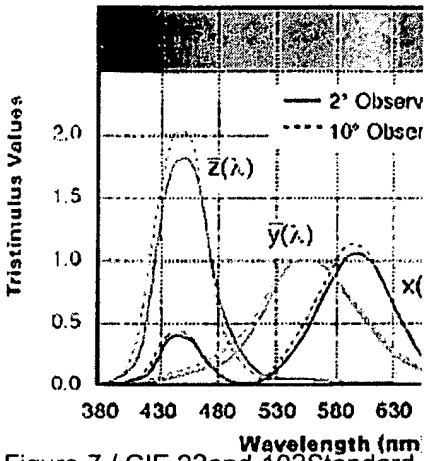

Figure 7 / CIE 2?and 10?Standard

CIELAB (L*a*b*)

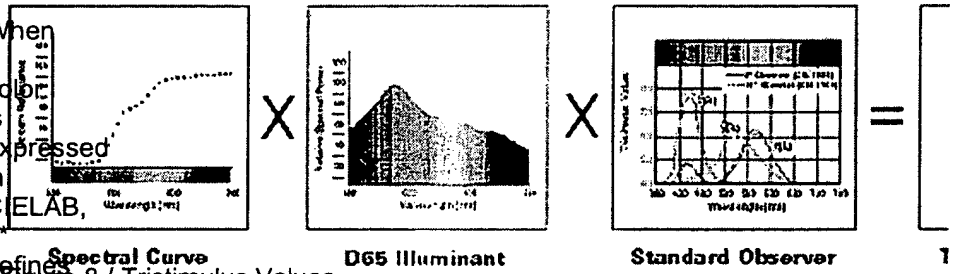

Figure 8 / Tristimulus Values

When a color is expressed in CIELAB, L* defines lightness, a* denotes the red/green value and b* the yellow/blue value.

Figures 11-12 show the color-plotting diagrams for L*a*b*. The a* axis runs from l measurement movement in the +a direction depicts a shift toward red. Along the b movement represents a shift toward yellow. The center L* axis shows L = 0 (black absorption) at the bottom. At the center of this plane is neutral or gray.

To demonstrate how the L*a*b* values represent the specific colors of Flowers A a have been plotted on the CIELAB Color Chart in Figure 11. A and B intersect at co identified respectively as points A and B. These points specify each flower's hue ((vividness/dullness). When their L* values (degree of lightness) are added in Figu color of each flower is obtained.

Color Differences, Notation and Tolerancing
Delta CIELAB

Assessment of color is more than a numeric expression. Usually it's an assessment of the color difference (delta) from a known standard. CIELAB is used to compare the colors of two objects. The expressions for these color differences are DL* Da* Db* or DL* Da* Db* (D or D symbolizes "delta," which indicates

difference).

Given DL* Da* Db*, the total difference or distance on the CIELAB diagram can be stated as a single value, known as DE*.

E*ab = [(DL2) + (Da2) + (Db2)]1/2

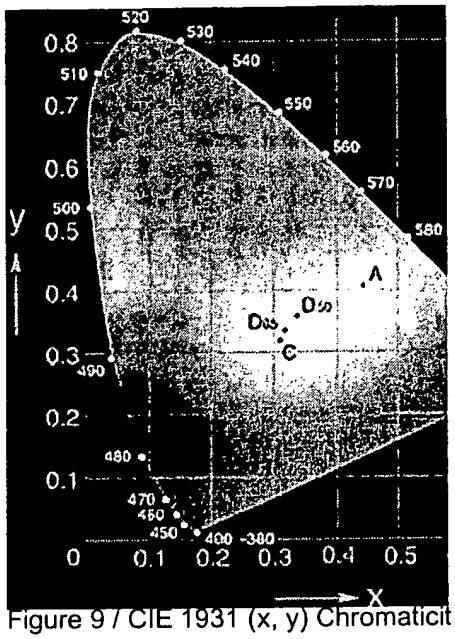

Figure 9 / CIE 1931 (x, y) Chromaticit

CIE Color Space Notation

DL* = difference in lightness/darkness value + = lighter - = darker

Da* = difference on red/green axis + = redder - = greener

Db* = difference on yellow/blue axis + = yellower - = bluer

DE* = total color difference value

Refer to Figure 11.

For more information on color, contact X Rite, phone 800/248.9748; fax 616/534.8960; visit www.x-rite.com; or e-mail info@x-rite.com

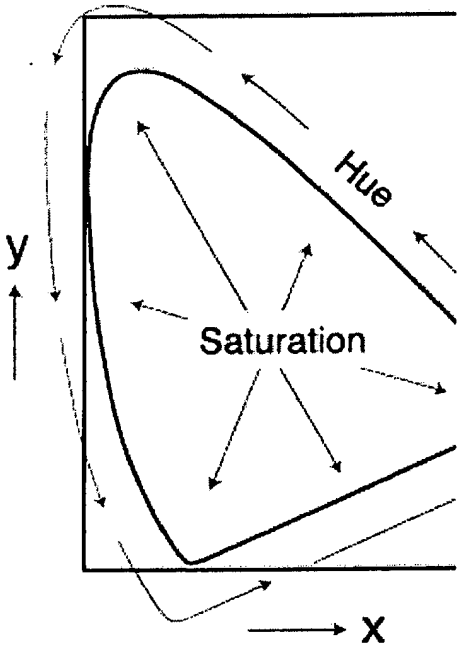

Figure 10 / Chromaticity Diagram

Applications

Spectrophotometry's applications are seemingly boundless. Color-matching measurements are made every day by those comparing a reproduced object to a reference point.

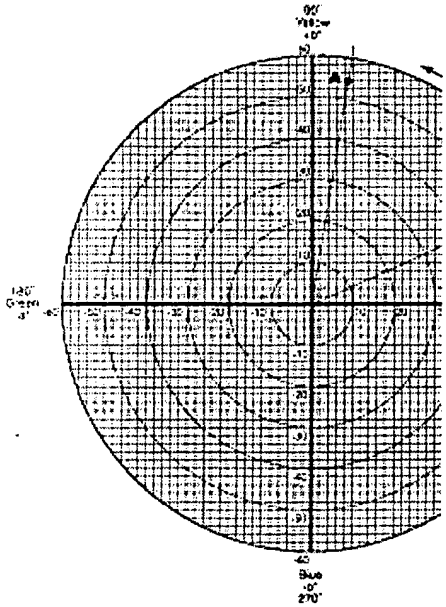

Figure 11 / CIELAB Color Chart

Spectrophotometry-assisted color measurement can be useful in areas including the following.

- Corporate logo standardization
- Color testing of inks
- Color control of paints
- Control of printed colors on packaging material and labels
- Color control of plastics and textiles throughout the development and manufacturing process
- Finished products like printed cans, clothing, shoes, automobile components, plastic components of all types.

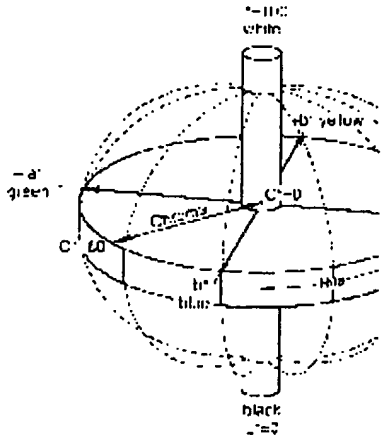

Figure 12 / The L* value is represen center axis. The a* and b* axes app horizontal plane.

Related Websites

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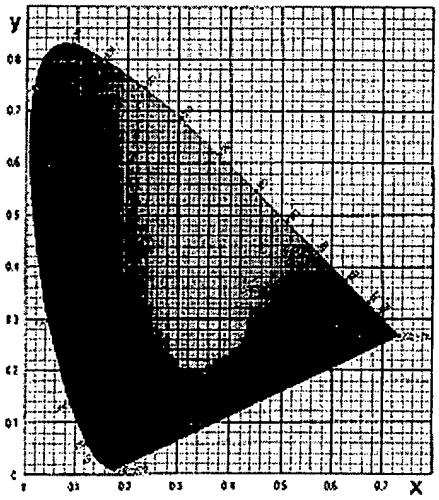
SUPPLEMENTAL READINGS
useful information about related subjects

COLOR GAMUTS

Starting With XYZ

The creation of a global color standard embracing the most important color gamuts and enabling consistant color communications is vital for the growth of color reproduction. The CIE, the Commission Internationale de l'Eclairage, plays a leading role in the definition of color systems.

In 1931 the CIE developed the XYZ color system, also called the "norm color system." This system is often represented as a two-dimensional graphic which more or less corresponds to the shape of a sail.



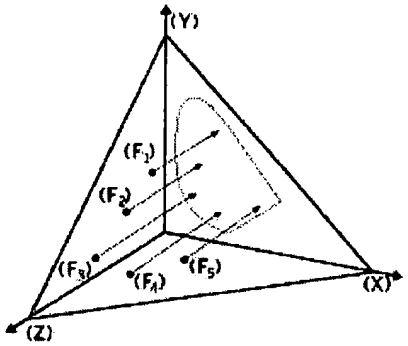
The red components of a color are tallied along the x (horizontal) axis of the coordinate plane and the green components along the y (vertical) axis. In this way every color can be assigned a particular point on the coordinate plane. As you can see, colors on the left tend toward gray, which means that their spectral purity is decreased.

What is not taken into consideration in the above model is the variant of brightness. If it were, the sail-like figure would look like a flat sack. More on that later.

This Isn't Rocket Science...Really!

The CIE color standard is based on imaginary primary colors XYZ -- which don't exist physically. They are purely theoretical and independent of device-dependent color gamuts such as RGB or CMYK. These virtual primary colors have, however, been selected so that all colors which can be perceived by the human eye lie within their color space.

The XYZ system is based on the response curves of the eye's three color receptors. Since these differ slightly from person to person, CIE has defined a "standard observer" whose spectral response corresponds more or less to the average response of the population. This objectifies the colorimetric determination of colors.



The three primary colors of the CIE XYZ reference system call for a spatial model with coordinates (X), (Y) and (Z), which is drawn as a chromaticity triangle. To arrive at a two-dimensional diagram (the sail shape), this chromaticity triangle is projected into the red-green plane.

This is only meaningful, however, if appropriate standardization is performed at the same time which allows the lost value (Z) to be read from the new two-dimensional model. This is achieved by introducing the chromaticity coordinates x, y and z. They are defined as follows:

- $x = X / (X + Y + Z)$
- $y = Y / (X + Y + Z)$
- $z = Z / (X + Y + Z)$

where $x + y + z = 1$

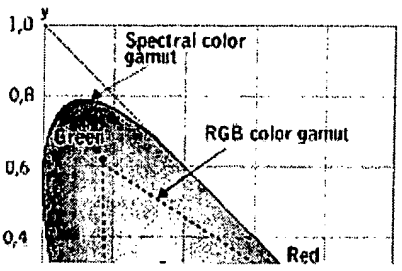
The value z of any desired color can be obtained by subtracting the chromaticity coordinates x and y from 1:

$1 - x - y = z$

However, the CIE chromaticity diagram does have a few drawbacks:

- Brightness is difficult to include
- There is a discrepancy between perceived color differences and the actual spacing of color in the system.

Adding Brightness to Color



A color is not defined fully by its chromaticity (x and y). A brightness coefficient also needs to be specified. The eye response curve for green is standardized in the XYZ system so that it

simultaneously reflects the sensation of brightness. That makes it identical to the V (l) curve. A color is only described in full if it contains the values x and y plus the brightness coefficient Y.

In the standard color triangle, the right-angled chromaticity triangle drawn between zero, x = 1 and y =1 represents the boundaries of this reference system. Chromaticities cannot lie outside the triangle. The closed curve section represents the position of the spectral colors.

While it is possible to define colors between the triangle and spectral color gamut, they are only realized on virtual basis, i.e. not physically. The primary colors RGB of a reproduction device -- such as a color monitor -- form a triangle within the spectral color gamut. That triangle represents a smaller color gamut with the achromatic point more or less in the center.

Exactly!

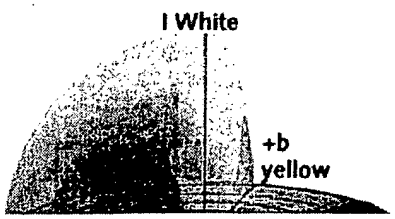
The introduction of the CIE color system made it possible to transform color determination from a quality-describing process -- "I want a bright red -- into a process which can be expressed in exact quantitative and numerical terms.

In addition to the quantitative judgement it allows, the CIE color space permits the results of additive color mixing to be presented in simple form. The results always lie on straight lines between the colors being mixed. The CIE standard also allows any desired color transformations from one color gamut to another. For example, the transformation of a given color from the RGB color gamut of a monitor to the CMYK gamut of a printing process is facilitated by this standard.

Perceived Color Differences

As mentioned, one problem with the XYZ color system is that colorimetric distances between the individual colors don't correspond to perceived color differences.

For example, in the figure above, a difference between green and greenish-yellow is relatively large, whereas the distance distinguishing blue and red is quite small.



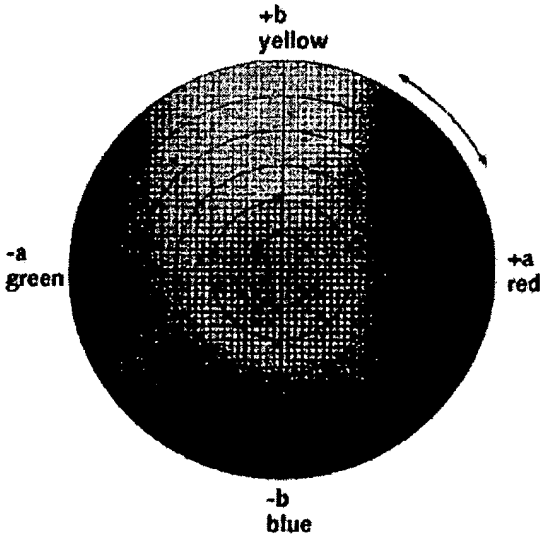
CIELAB: CIE solved this problem in 1976 with the development of the Lab color space. A three-dimensional color space

was the result.

In this model, perceived color differences correspond to measured linear colormetric distances. The "a" axis extends from green (-a) to red (+a) and the "b" axis from blue (-b) to yellow (+b). The brightness (L) increases from the bottom to the top of the 3-dimensional model.

With CIELAB what you see is what you get -- and that's exactly what you want in color management.

CIELAB and Brightness



A horizontal cross-section of the CIELAB model reveals a plane which depicts all values of the same brightness. That means every color can be named exactly using its specific a, b values together with its brightness, L.

The important aspect of this color space is that it is device independent -- completely independent of weather, mood or scanner or color copier -- and is therefore objective.

Thus, the same combination of a, b, and L values always refers to the same color...no matter what.

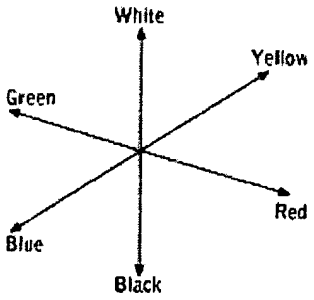
CIELAB Color Space

Color vision is complex. While the retina at first registers three color stimuli -- relating to red, green and blue light rays -- it is not until a further processing stage that three sensations are generated:

- a red-green sensation
- a yellow-blue sensation
- a brightness sensation

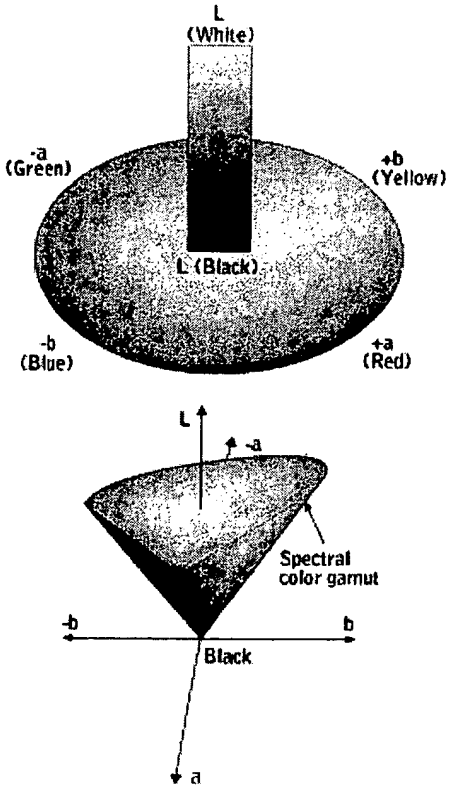
These sensations are used to develop a system known as the complementary color system. It is based on the differences of three

elementary color pairs: red-green, yellow-blue and black-white.



You know from experience that red can never contain green components, blue cannot contain yellow components and white never contains black. It follows that in a reference system which has been designed correctly -- in visual sensation terms -- the achromatic brightness information and the color information should be separated not only quantitatively but qualitatively.

Hue and chroma are defined by the coordinates a and b which can have both positive and negative values. As with the standard color triangle, this color system represents all conceivable colors.



Thus, numerical values for chroma and hue are derived from a and b:

Hue: h = arctan (b/a)
(This corresponds to the angle between the color vector and the +a axis)
Chroma: c = (a2 + b2)1/2
(This corresponds to the distance between the color locus and the mid-point)
Brightness: L
(The third characteristic is represented vertically by means of a brightness scale, designated L, with scale values ranging from 0 for black to 100 for white)

A color gamut in CIELAB appears to the right (in idealized form, of course)

For the sake of clarity, the different brightnesses of the spectral color curve are not shown in their entirety. The model is delimited at the top by a horizontal section. On the outer surface lie all colors of maximum chroma. As colors become darker they lose chroma. This is logical considering that, when the minimum brightness value is reached, every color becomes black and the chroma value is zero.

Thus, a color gamut based on real colors

would actually look like as you see to the immediate right. And, as we understand the way color exists in the real world, two things are clear:

- As the brightness increases or decreases, the chroma reduces to zero when white or black is reached.
- In contrast to the CIE color triangle, the connecting lines between the primary colors are not straight.

The reason for this lies in the visual equispacing of colors in CIELAB. This has been achieved through a non-linear transformation of the XYZ values into CIELAB values.

The formulas for the transformation of XYZ to CIELAB are based on:

- L = 116 Y1/3 - 16
- a = 500 (X1/3 - Y1/3)
- b = 200 (Y1/3 - Z1/3),

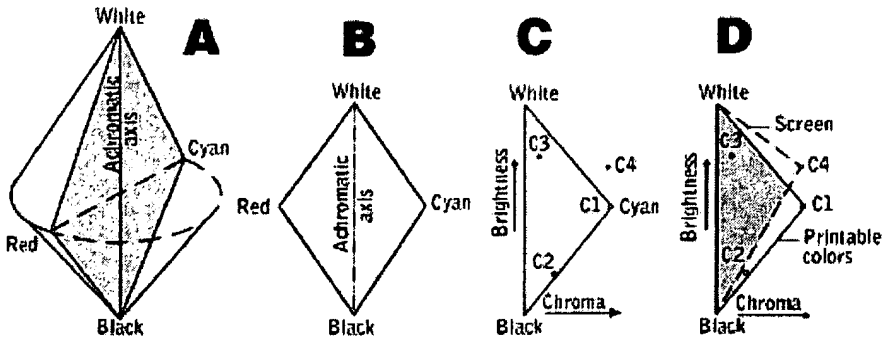
with X, Y and Z standardized to 1.

Advantages of CIELAB in Color Reproduction

The CIELAB color space has many advantages. Above all, it is not dependent on any particular device independent so you can set colors as you perceive them when operating a reproduction system.

CIELAB color space -- like the XYZ color space -- is able to represent all real color gamuts as subsets.

Assume a reproduction system which is based on the RGB color space. The RGB color values need to be converted to CMYK color values for the printing process. The two color spaces coincide in neither size nor location. Due to the fact that the system has RGB as its reference system, it follows that colors of the CMYK color space which cannot be represented in RGB cannot be printed in CMYK. RGB acts as a restriction to CMYK. For example, chromatic cyan cannot be represented on the RGB monitor and, under such circumstances, becomes a non-reproducible color.



To illustrate, look at the cross-section of a stylized color gamut (figure A). In the next illustration (figure B), you now see the cyan-red plane. The problem can be shown in simpler form if only one of the two planes is observed -- in this case the cyan plane (figure C).

The colors depicted show:

- C1 -- cyan with maximum chroma
- C2 -- cyan with the highest possible chroma for this brightness value
- C3 -- a pale near-achromatic cyan
- C4 -- a cyan which lies outside the color space

In the diagram, all the colors have the same hue: cyan. It is possible to reproduce them all -- except C4 which lies outside the color space. If the printable colors are included, the two color spaces are not identical (figure D).

The fact that the two color gamuts overlap means that only the colors in a common subset (shaded area) can be reproduced both on the monitor and in print.

In a device-dependent reference system like RGB or CMYK, colors lying outside their reference system cannot be reproduced even if they are present in the target color gamut. The advantage of global reference systems such as the XYZ or CIELAB, which are unrestricted, become obvious through this example.

More Reading

Paper for IS&T NIP16 Conference, Vancouver, Canada, Oct. 16-20, 2000 (Final manuscript)

CIE Fundamentals for Color Measurements

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Abstract

The paper first overviews the CIE system of colorimetry, covering CIE 1931 color matching functions, *XYZ* tristimulus values, the *x, y* diagram, the 1976 *u', v'* diagram, and the evolvement of CIELUV and CIELAB color spaces and color difference formulae. The paper reviews the measurement of object colors introducing CIE standard illuminants and the CIE terminology for color and reflectance measurements, then the measurement of light-source colors (including displays) with calculation of correlated color temperature and color rendering indices. The paper also discusses practical aspects of color measurements for imaging applications using spectroreflectometers, spectroradiometers, and tristimulus colorimeters. Overview is given for calibration and verification of instruments' accuracy, spectral irradiance and reflectance standards (available from national laboratories), and uncertainty components.

Introduction

The term *color* is used with different meanings in different technologies. To lamp engineers, color refers to a property of light sources. To graphics art engineers, color is a property of an object's surface (under a given illumination). In each case, color must be physically measured in order to record it and reproduce the same color. The perception of color is a psychophysical phenomenon, and the measurement of color must be defined in such a way that the results correlate accurately with what the visual sensation of color is to a normal human observer. *Colorimetry* is the science and technology used to quantify and describe physically the human color perception. The basis for colorimetry was established by CIE (Commission Internationale de l clairage) in 1931 based on visual experiments. Even though limitations are well recognized, the CIE system of colorimetry remains the only internationally agreed metric for color measurement. All the official color-related international standards and specifications use the CIE System. The CIE system works well in most cases, but one should know the assumptions and limitations in visual conditions where the CIE system is defined. In this paper, the CIE system of colorimetry is briefly overviewed, and then practical aspects of color measurements and instruments – spectroreflectometers, spectroradiometers, and colorimeters – are discussed, with a focus on the calibration methods and standards. Uncertainty components and correction for errors are also discussed. For further details in colorimetry and color science, refer to official CIE publications [1-3] and many other appropriate references [4].

CIE System of Colorimetry

History and Basis

By the early 19th century, it became known that there were three types of cones in the eyes to sense colors. It was also known that two light stimuli having different spectra could produce the same color (*metamerism*). It was inferred that each cone had spectral sensitivities corresponding to R, G, B (*Trichromatic Theory*, Young, 1800's) or sensitivities corresponding to opponent colors, W/Bk, R/G, and Y/B (*Opponent Theory*, Hering, late 1800's). The spectral sensitivities of the cones were yet to be known at that time, but a color could be matched by combination of three primaries, which could be used to specify color (Maxwell, 1860's).

Around 1930, Wright and Guild made independent visual experiments to derive color matching functions using three R/G/B primaries, the results of which became the basis of the CIE colorimetry system. Observers viewed a 2° circular split field and their task was to adjust the three primaries so that their mixture visually matched the visible spectrum presented sequentially. Fig. 1 shows the results of this experiment using a set of primaries at 435.8 nm, 546.1 nm, and 700 nm. This is the plot of the relative intensities of R,G,B primaries (white-balanced to equal energy white) that matched monochromatic stimulus at each wavelength. The minus value means that one of the primary colors had to be added to the monochromatic stimulus to make the match. In 1931, the CIE adopted these results as the standardized RGB color matching functions denoted as $\bar{r}(\lambda), \bar{g}(\lambda), b(\lambda)$. Then still in 1931, the CIE transformed the RGB color matching functions to a new set of primaries, XYZ, to eliminate negative values and with the $\bar{g}(\lambda)$ function set to

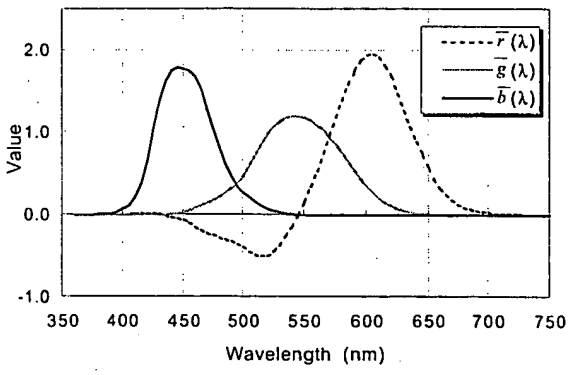


Figure 1 – CIE 1931 RGB color matching functions using primaries at 435.8 nm, 546.1 nm, and 700 nm.

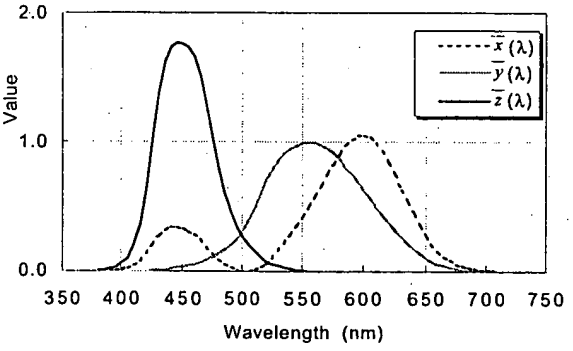


Figure 2 – CIE 1931 XYZ color matching functions.

be equal to the 1924 CIE spectral luminous efficiency function, $V(\lambda)$. This is simply a linear transformation from the RGB color matching functions, and the resulting functions, shown in Fig. 2, are called the *CIE 1931 XYZ color matching functions* denoted as $\bar{x}(\lambda), \bar{y}(\lambda), \bar{z}(\lambda)$. There are two important assumptions in these color matching functions: First, rod intrusion is excluded, thus it applies only to narrow field-of-view (2°). Second, additivity of light stimuli (*Grassmann's Law*) is assumed. The ideal observer whose color-matching properties correspond to the color matching functions $\bar{x}(\lambda), \bar{y}(\lambda), \bar{z}(\lambda)$ with the 2° field of view and satisfying the Grassmann's Law is called the *CIE 1931 standard colorimetric observer*. Practically, this observer can be used for field-of-view of up to 4°. In 1964, the CIE defined a second set of standard color matching functions for a 10° field-of-view, denoted as $\bar{x}_{10}(\lambda), \bar{y}_{10}(\lambda), \bar{z}_{10}(\lambda)$, to supplement those of the 1931 standard observer. This is called the *CIE 1964 supplementary standard colorimetric observer*, and can be used for a field of view greater than 4°.

Tristimulus Value

By using the color matching functions, light stimuli having any spectral power distribution can be specified for color by three values:

$$X = k\int_{\lambda} \Phi(\lambda)\bar{x}(\lambda)\mathrm{d}\lambda$$
$$Y = k\int_{\lambda} \Phi(\lambda)\bar{y}(\lambda)\mathrm{d}\lambda \qquad (1)$$
$$Z = k\int_{\lambda} \Phi(\lambda)\bar{z}(\lambda)\mathrm{d}\lambda,$$

where $\Phi(\lambda)$ is the spectral distribution of light stimulus and k is a normalizing constant. These integrated values are called *Tristimulus values*. For light sources and displays, $\Phi(\lambda)$ is given in quantities such as spectral irradiance and spectral radiance. If $\Phi(\lambda)$ is given in an absolute unit and k=683 lm/W is chosen, Y yields an absolute photometric quantity such as illuminance or luminance.

For object colors, $\Phi(\lambda)$ is given by

$$\Phi(\lambda) = E(\lambda)\cdot R(\lambda), \qquad (2)$$

where $R(\lambda)$ is the spectral reflectance or radiance factor of the object, $E(\lambda)$ is the (relative) spectral irradiance of the illumination, and

$$k = 100 / \int_{\lambda} E(\lambda)\bar{y}(\lambda)\mathrm{d}\lambda. \qquad (3)$$

Actual integration can be carried out by numerical summation of spectral data.

Chromaticity Diagrams

By projecting the tristimulus values on to the unit plane (X+Y+Z=1), color can be expressed in a two dimensional plane. Such a unit plane is known as the chromaticity diagram. The color can be specified by the chromaticity coordinates (x, y) defined by

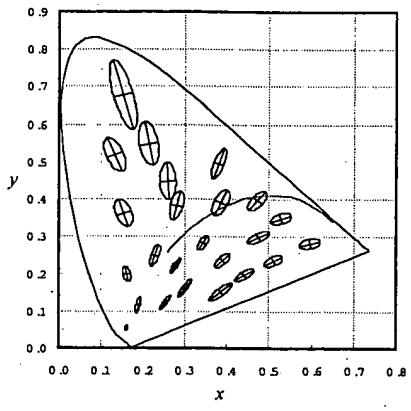
$$x = \frac{X}{X+Y+Z}; \quad y = \frac{Y}{X+Y+Z}. \qquad (4)$$

The diagram using the chromaticity coordinates (x, y) is referred to as the *CIE 1931 chromaticity diagram*, or the *CIE (x, y) chromaticity diagram*.

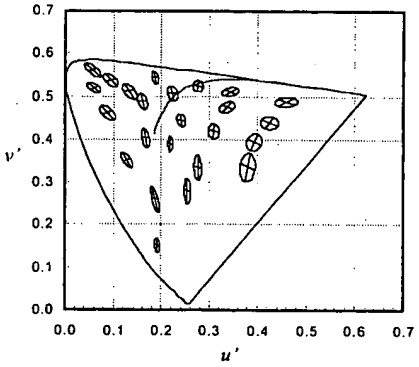
The (x, y) chromaticity diagram is very non-uniform in terms of color difference. The minimum perceivable color differences in the CIE (x, y) diagram, known as *MacAdam ellipses*, are shown in Fig. 3(a). To improve this, in 1960, CIE defined an improved diagram – *CIE 1960 (u, v) chromaticity diagram* (now deprecated), and in 1976, a further improved diagram – *CIE 1976 uniform chromaticity scale (UCS) diagram*, with its chromaticity coordinate (u', v') given by

$$u' = \frac{4X}{X+15Y+3Z}; \quad v' = \frac{9Y}{X+15Y+3Z}. \qquad (5)$$

The 1976 (u', v') chromaticity diagram is significantly more uniform than the (x, y) diagram, yet it is still far from perfect as shown in Fig. 3 (b).



(a) CIE 1931 (x, y) chromaticity diagram



(b) CIE 1976 (u',v') chromaticity diagram

Figure 3 – MacAdam Ellipses in CIE 1931(x, y) diagram and the CIE 1976 ($u'v'$) diagram. The ellipses are plotted 10 times their actual size.

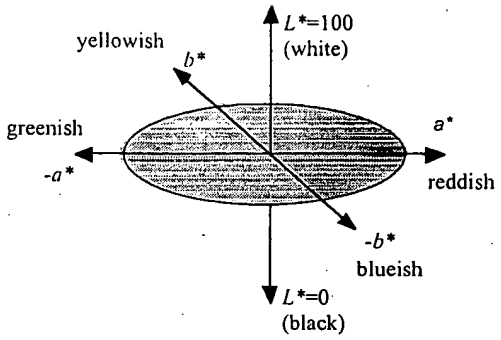


Figure 4 – CIELAB color space.

Uniform Color Spaces and color difference formulae

Three attributes of color, are hue, chroma (saturation), and lightness, and are expressed in a three dimensional space. In the chromaticity diagrams as mentioned above, lightness is missing, and the hue and chroma are laid out very nonlinearly. To allow accurate specification of object colors and color differences, CIE recommended three-dimensional uniform color spaces – CIELAB and CIELUV in 1976. Since the equations are long, they are omitted here. These are called the *CIE 1976 ($L^*a^*b^*$) color space* or *CIELAB color space*, and the other, *CIE 1976 ($L^*u^*v^*$) color space* or *CIELUV color space*, and have similar structures as the Munsell color solid. In imaging applications, CIELAB space is commonly used. In CIELAB space, L^* shows the lightness, and (a^*, b^*) the color as shown in Fig. 4, The coordinate (L^*,a^*,b^*) is calculated from the (X,Y,Z) of the given light stimulus and (X_n,Y_n,Z_n) of the white point. Therefore, the CIELAB space has a function of correcting for chromatic adaptation to the white point, and is intended for object color and displays. The color difference in the CIELAB space is calculated as the Euclidean distance between the points in this three-dimensional space, and is given by,

$$\Delta E^*_{ab} = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]^{1/2}. \quad (6)$$

This equation is called the *CIE 1976 ($L^*a^*b^*$) color difference formula*. The chroma C^*_{ab} and the hue angle h_{ab} are also calculated from *($L^*a^*b^*$)* by

$$C^*_{ab} = (a^{*2} + b^{*2})^{1/2} \quad (7)$$

$$h_{ab} = \tan^{-1}(b^*/a^*). \quad (8)$$

The CIELUV space is defined in a similar manner, and the coordinate (L^*,u^*,v^*) is calculated from the Y and (u',v') of the given light stimulus and the white point. Refer to references 1 and 4 for the details.

While the color difference ΔE^*_{ab} is widely used, its chroma scale is known to be fairly nonlinear. For more accurate color difference evaluations, CIE recommended an improved industrial color difference formula in 1994 - *CIE94 Formula*[5]. The color difference ΔE^*_{94} is calculated from ΔL^*, ΔC^*_{ab}, and ΔH^*_{ab} of the CIELAB formula. Another improved formula, *the CMC Colour Difference Formula*, is mainly used in textile industry [6]. Further improved color difference formulae are being investigated by CIE (TC1-55).

Correlated Color Temperature

The color of light sources are measured and expressed by the resultant chromaticity coordinates (x,y) or (u',v'). However, it is difficult to relate these values immediately to particular colors. For such practical purposes, the color of "white light" can be expressed by *correlated color temperature (CCT)* in the unit Kelvin [K]. The CCT is defined as the temperature of the Planckian radiator whose perceived color most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions [7]. For example, 2800 K is immediately associated with the warm color of incandescent lamps, and 9000 K the bluish white from a CRT. According to this definition, CCT can be calculated using one of the chromaticity diagrams.

Due to the long tradition, CIE still recommends to calculate CCT using the 1960 (u,v) chromaticity diagram (now deprecated)[1]. From (u',v') coordinates, (u,v) can be obtained by $u=u'$, $v=2v'/3$. On the (u,v) diagram, find the point on the Planckian locus that is at the shortest distance from the given chromaticity point. CCT is the temperature of the Planck's radiation at that point. A practical way of computing CCT is available[8].

Color Rendering Index

For lamps in lighting applications, it is important to evaluate how well a given illumination can render colors of objects in the illuminated scene. The CIE defined the *color rendering index (CRI)* for the first time in 1965. Going through minor revisions, the CIE recommendation[9] has been in wide use mainly by lighting industry. The procedure of calculation is first to calculate the color differences ΔE_i (on the 1964 $W^*U^*V^*$ uniform color space – now obsolete) of selected 14 Munsell samples between the conditions when illuminated by a reference illuminant and when illuminated by the given illumination. The process incorporates the von Kries chromatic adaptation transformation. Then the *Special Color Rendering Index* R_i for each color sample is calculated by

$$R_i = 100 - 4.6\,\Delta E_i. \qquad (9)$$

This gives an indication of color rendering for each particular color. The *General Color Rendering Index*, R_a, is given as the average of the first eight color samples (medium saturation). With the maximum value being 100, R_a gives a scale that matches well with the visual impression of color rendering. For example, lamps having R_a values greater than 80 may be considered suitable for interior lighting, and R_a greater than 90 for visual inspection purposes.

Standard Illuminants

The colors of objects change depending on the spectrum of illumination. Thus, there is a need to specify the illumination for any object color specification. For this purpose, colorimetric illuminants are standardized by CIE and ISO[1,2]. *CIE Standard Illuminant A* (representative of tungsten-filament lighting with a color temperature of 2856 K) and *CIE Standard Illuminant D65* (representative of average daylight with a CCT of 6500 K) are the two primary standard illuminants[2]. It is recommended that either of these illuminants be used in all applications. However, other phases of daylight illuminant are already widely used in specific application areas, and CIE also defines D50, D55 and D75[1]. Equations are available to obtain the data table for Illuminant A and any phase of D illuminant. Even though no longer recommended for use, Illuminant B was intended to represent direct sun light with a CCT of ~4900 K, and Illuminant C to represent average daylight with a CCT of ~6800 K and to be realized by a tungsten source combined with a prescribed liquid filter.

Measurement of Object Color

Terminology of reflectance measurement

Object color, in most cases, is determined by spectral reflectance measurements. The terminology for reflectance measurements is often confused and misused by the imaging community. Some important terms are reviewed here according to Ref. 7.

Reflectance is the ratio of the reflected radiant or luminous flux to the incident flux in the given conditions of spectral composition, polarization, and geometrical distribution. The geometrical conditions are very important for correctly describing and measuring reflectance, and can lead to confusion regarding reflectance measurements.

Perfect Reflecting Diffuser is an ideal isotropic diffuser with a reflectance equal to 1.

Reflectance Factor is the ratio of the radiant or luminous flux reflected in the direction delimited by the given cone to that reflected in the same direction by a perfect reflecting diffuser identically irradiated or illuminated.

Radiance Factor is the ratio of the radiance of a surface element in a given direction to that of a perfect reflecting diffuser identically irradiated.

Radiance Coefficient is the ratio of the radiance of the surface element in the given direction to the irradiance on the medium.

There are several important implications that follow from the above definitions. "Factor" in these terms means with respect to a perfect reflecting diffuser, and therefore can be greater than one. Reflectance, on the other hand, can never be greater than one, and is often used descriptively to represent all of these reflectance-related quantities. Reflectance factor is defined in terms of a cone, while radiance factor is defined only in terms of a direction. Therefore, if the solid angle of the cone approaches zero, the reflectance factor approaches the radiance factor for the same conditions of irradiation. If the solid angle of the cone approaches 2π sr, the reflectance factor approaches the reflectance for the same conditions of irradiation. Finally, radiance coefficient is similar to the *bi-directional reflectance distribution function (BRDF)* except that the latter is defined for directional incident flux.

Illuminating and viewing conditions

Geometry is one of the most important conditions to specify in reflectance colorimetry. For the colorimetry of objects, CIE recommends the use of one of four standard geometries – 45°/normal (45/0), normal/45° (0/45), diffuse/normal (d/0), and normal/diffuse (0/d). The details on this subject are covered by the paper by Danny Rich[10].

Reflectance standards

Most spectroreflectometers are calibrated using white reflectance standards for one of the geometries listed above. *Spectral radiance factor standards* are needed for the 45/0,

0/45, and d/0 geometries, while *diffuse spectral reflectance standards* are needed for the 0/d geometry. Highly diffuse white materials such as pressed or sintered polytetrafluoroethylene (PTFE) are used for such standards. Because absolute measurements of radiance or reflectance factors are very difficult, calibrated standards are provided by national metrology laboratories [11, 12], and industrial measurements are normally made with traceability to these standards. Since a perfect reflecting diffuser does not exist, the radiance factor is calibrated by absolute measurements of the radiance coefficient. The radiance factor is then obtained from the radiance coefficient by multiplying by the constant π.

The reflectance characteristics of even the most diffuse materials are sensitive to the illumination and viewing angles. An example for the measured spectral radiance factor of a pressed PTFE sample is shown in Fig. 5.

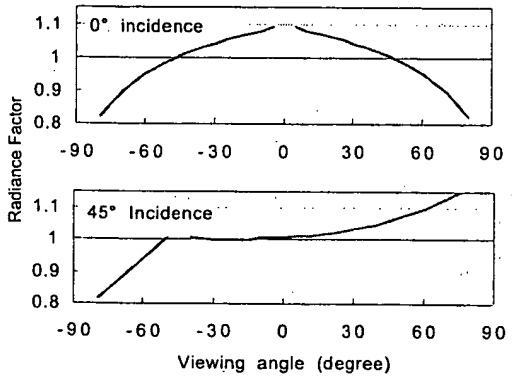


Figure 5 – Radiance factor of pressed PTFE as a function of viewing angle at a wavelength of 555 nm.

Measurement instruments for object color

Spectroreflectometers are commonly used for object color measurements. These instruments measure the spectral reflectance of a test sample under a given geometrical condition, and most are calibrated by a reference standard traceable to a national metrology laboratory. Thus, their measurement uncertainty first depends upon the uncertainty of the reference standard. Uncertainties also arise from the characteristics of the spectroreflectometer. Effects contributing to the uncertainty include wavelength error, detector nonlinearity, stray light, bandwidth, the geometrical conditions for both illumination and viewing, and measurement noise. The effect of bandwidth can be serious for bandwidths greater than 10 nm. For example, a 20 nm bandwidth can cause errors of as much as two to three CIELAB units for saturated colors. An effective correction method is available [13]. Recommendations for standard methods to characterize spectroreflectometers are being developed by the CIE TC2-28 committee. Finally, the uncertainty can also depend upon the characteristics of the test sample. For example, saturated color samples tend to have larger errors.

In order to verify stated measurement uncertainties for spectrophotometers, calibrated color standards are used. Ceramic tiles of various colors manufactured by the British Ceramic Research Association (BCRA) are available from the National Physical Laboratory (NPL), UK and will be available from the National Institute of Standards and Technology (NIST), USA.

For measurements of small color differences, tristimulus colorimeters are used because of their benefits of high speed and low cost. The uncertainty of tristimulus colorimeters is limited, however, due to the mismatch of the illumination to the CIE illuminants and of the spectral response of the detectors to the CIE color matching functions. Thus, they are not suitable for absolute color measurements over a wide range of colors [14].

A number of recommendations on spectral reflectance and color measurements are available from the American Society for Testing and Materials (ASTM) [15].

Measurement of Light Source Color

The measurement of light source color is represented by measurement of lamps, LEDs, and displays. Both spectro-radiometers and tristimulus colorimeters are widely used.

Measurement instruments for light source color

Spectroradiometers are normally designed to measure either *spectral irradiance* (unit: W m^{-2} nm^{-1}) or *spectral radiance* (unit: W sr^{-1} m^{-2} nm^{-1}). The former is equipped with a diffuser or a small integrating sphere as input optics, and the latter equipped with imaging optics. For example, lamps are normally measured for spectral irradiance and displays are measured for spectral radiance to obtain colors. There are two types of spectroradiometers; mechanical scanning type and diode-array type. Generally, the former is more accurate but slow, and the latter is fast but less accurate. Spectroradiometers are calibrated against spectral irradiance or radiance standards traceable to national standards [16]. Thus, their measurement uncertainty first depends on that of the reference standard. Then, like spectroreflectometers, there are many other uncertainty components including wavelength error, detector nonlinearity, stray light of monochromator, bandwidth, measurement noise, etc. The errors vary depending on the spectrum of the source measured. Even if the instrument's specification shows a low uncertainty for a tungsten source (normally a calibration source), the instrument's uncertainty for other colors can be much larger. For example, typical diode-array spectroradiometers exhibit errors of up to 0.005 in x, y for various display colors while they are specified for an uncertainty of ~0.001 in x, y for CIE Illuminant A. For applications where highest accuracy is required, it is necessary to calibrate the instruments for various actual colors to be measured. For color measuring instruments for displays, such a calibration facility and services are available [17].

Tristimulus colorimeters are also widely used for colorimetry of lamps and displays. While they have benefits of low cost and high speed, errors due to spectral mismatch are inevitable and their uncertainty for measurement tend to be higher than spectroradiometers. To improve accuracy in display measurements, effective correction techniques are available [18, 19].

Uncertainty of measurements

Uncertainty of measurement is an estimate of the range of values within which the true value lies. When making colorimetric and photometric measurements, it is important to know the uncertainty of the results. The uncertainty in a measurement depends not only on that of the measurement instruments but also on the measurement conditions. The measurement uncertainty must be stated for official exchange of measurement results, and it must follow the international recommendations [20]. The term *accuracy* is no longer recommended to specify the values of uncertainty. For industrial measurements, it is now recommended to use an *expanded uncertainty* with a coverage factor k=2. See Ref. 20 for the details.

Conclusion

An overview has been given for the fundamentals of the CIE colorimetry system and practical issues in measurements of object color and light-source color. When making measurements, one should be aware of the uncertainty of the measurement instruments and uncertainty components arising from the measurement conditions. Refer to the given references for the details in the subjects covered in this paper.

Acknowledgement

The author thanks Danny Rich of Sun Chemical, Edward Early and Maria Nadal of NIST for their providing useful information and comments.

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Biography

Yoshi Ohno received a Ph.D. in engineering from Kyoto University, Kyoto, Japan in 1993. He started his career in photometry and colorimetry at Matsushita Electric Ind. Co. in Japan in early 1980s, and immigrated to the U.S. in 1992 to be employed by NIST. He is currently the project leader for Photometry at Optical Technology Division, NIST, and recently led a project for colorimetry of displays. He serves as the Secretary of CIE Division 2, and chairs two CIE technical committees in photometry. He is a member of CIE TC1-48 (revision of CIE 15.2) and IEC TC100/TA2. Email: ohno@nist.gov

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Suresh Shankarappa VAGARALI *et al.*	)	
	)	
Application No. 09/162,206	)	Group Art Unit: 1754
	)	
Filed: September 28, 1998	)	Examiner: S. Hendrickson
	)	
For: HIGH PRESSURE/HIGH TEMPERATURE PRODUCTION OF COLORLESS AND FANCY COLORED DIAMONDS	)	

DECLARATION UNDER 37 CFR § 1.132

I, Suresh Vagarali, do hereby declare to my own knowledge that:

1. I am currently employed as a Technology Development Leader at GE Superabrasives, an affiliate company of GE Superabrasives of Ireland, an assignee of the above identified application.

2. I received my Ph.D. in Materials Science from University of Southern California in 1979.

3. I have over 14 years experience in superabrasive materials, synthetic diamonds, and natural diamonds, including processing of natural diamonds and synthesis of gem quality jadeite.

4. I am an inventor or co-inventor of five U.S. patents. I have sixteen publications in technical journals. My CV is attached as Exhibit A.

5. I make this declaration to provide data in support of the above identified patent application.

6. I have prepared under my direct supervision and control the following experiments to evaluate the effect of pressure and temperature for changing the color of diamonds as disclosed in U.S. Patent No. 3,134,739 ("Cannon"). These experiments were run to determine the veracity of the Cannon invention as defined by the statement, "At high pressures and temperatures, diamonds grown become more clear and white, but aluminum diffusion provides a more marked and contrasting change to colors." (Cannon, column 6 line 73 to column 7, line 1). Experiments 2-4 below repeat Examples 5, 4 and 6, respectively, of Cannon, column 4, lines 48-60. Experiment 1 below repeats Example 5 of Cannon except that aluminum disks are not used.

7. All Experiments were run using Type Ia natural brown diamonds, which falls within Cannon's disclosure referencing natural and man-produced diamonds generally. See Cannon, col. 3, lines 16-20. The Examples in the specification demonstrate the claimed methods using Type Ia natural brown diamonds (Examples III and IV) and Type IIa natural brown diamonds (Examples I, II, V and VI). The claims of this application are currently directed towards methods for changing the color of colored Type II natural diamonds.

Experiment 1. A brown Type Ia natural diamond weighing 0.1957 gm was embedded in 0.500" thick graphite pill. The graphite used for pressing the pill is Carbone grade MF2027P powder with maximum impurity content of 10 ppm. The pill was placed inside MgO cups and then in graphite heater tube. The cell assembly was subjected to 60 kbar[1] pressure, 1500° C temperature for 20 minutes. After the completion of the run, the diamond was removed from the cell and was cleaned using molten salt bath containing 96% NaOH and 4% KNO_3 at 1250° F for 25 minutes.

Experiment 2. A brown Type Ia natural diamond weighing 0.2335 gm was embedded in 0.330" thick graphite pill made of Carbone MF2027P powder. Four aluminum discs each with thickness of 0.010" were placed on both side of the graphite pill. The aluminum content of the discs was 99.4% (minimum). Finally, 0.045" thick graphite pills were placed at the ends bringing the total thickness of the assembly to 0.500". The above assembly was placed inside MgO cups and then in graphite heater tube. The cell was subjected to 60 kbar, 1500° C temperature for 20 minutes. After completion of the run, the diamond was removed from the cell and was cleaned by using hot acid mixture of 90% sulfuric acid and 10% nitric acid for 2 hours. After acid cleaning the diamond was rinsed using distilled water.

Experiment 3. A brown Type Ia natural diamond weighing 0.2557 gm was embedded in 0.330" graphite pill. The remaining details of the cell assembly are the same as in Experiment 2. The cell was subjected to 35 kbar pressure and 1100° C for 20 minutes. The diamond was recovered from the cell and then cleaned using the same acid cleaning procedure as in Experiment 2.

Experiment 4. A brown Type Ia natural diamond weighing 0.1957 gm (same as in Experiment 1) was embedded in 0.330" thick graphite pill. The remaining details of the cell assembly are the same as in Experiment 2. The cell was subjected to 60 kbar pressure and 1400° C temperature for 20 minutes. The diamond was recovered from the cell and then cleaned using the same acid cleaning procedure as in Experiment 2.

[1] 1 bar of pressure equals approximately 1 atmosphere of pressure, so 60 kbar equals approximately 60,000 atm.

The color / appearance of each diamond before and after the high pressure / high temperature treatment in the reactor vessel was recorded. The results are shown below:

Example	BEFORE color of diamond	Reactor Pressure (kbar)	Reactor Temperature °C	Time (minutes) in Reactor	Use of Al. disks	AFTER color of diamond	OBSERVED change in diamond color
1	Brown	60	1500	20	N	Brown	None
2	Brown	60	1500	20	Y	Brown	None
3	Brown	35	1100	20	Y	Brown	None
4	Brown	60	1400	20	Y	Brown	None

8. The diamonds were examined BEFORE and AFTER the experiments. They remained the same brown color. I did not see any change in color in any of the four experiments. I therefore conclude that the statement in Cannon that "diamonds grown become more clear and white, but aluminum diffusion provides a more marked and contrasting change to colors," is false (Cannon, column 6 line 74 to column 7, line 1). I further conclude that no observable change in color occurs in diamonds that are processed under the pressure and temperature conditions disclosed in Cannon.

9. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,

August 13, 2002

Date

Suresh S. Vagarali

Exhibit A: CV of Suresh S. Vagarali

EXHIBIT A: CV of Suresh S. Vagarali

Education:

Ph. D. Materials Science, 1979, University of Southern California, Los Angeles, CA.
B. S. Metallurgical Engineering, 1969, University of Mysore, Mysore, India

Training:

Robust Design (2001)
DFSS Training (2000)
Leadership Skills Development Course (1998)
Six Sigma (MAIC) Training (1996)

Employment History:

7/1997 to Present: Technology Development Leader, GE Superabrasives, Worthington, OH.
7/1988 to 6/1997: Sr. Research Engineer, GE Superabrasives, Worthington, OH.
2/1988 to 6/1988: Sr. Research Engineer, Norton Company, Troy, NY.
4/1982 to 2/1988: Sr. Research Engineer, Norton Company, Worcester, MA.
1/1979 to 4/1982: Asst. Research Engineer, University of California, Santa Barbara, CA.

Qualifications:

- Lead inventor of patent on Synthetic Imperial Grade Jadeite, approval received from patent office (2001)
- Winner of 1999 GE Plastics CHARLES E. REED Process Innovation Award for work on Bellataire Gem Diamond Project (2000)
- Award of Stock Options and Restricted Stock Units for work on Bellataire Gem Diamond Project (1998)
- Five US/European Patents received and seven applications pending
- Strong technical background in materials research (cell design and synthesis of new products)
- Expertise in transfer of technology to an overseas plant
- Three management awards at GE Superabrasives
- Sixteen publications in technical journals

List of U.S. Patents:

6,377,340: Method of detection of natural diamonds that have been processed at high pressure and high temperatures
5,869,015: Method for producing cubic boron nitride using melamine as catalyst
5,022,894: Diamond compacts for rock drilling and machining
4,741,743: Grinding wheel with combination of fused and sintered abrasive grits
4,609,381: Grinding aid

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Simulation of diamond metallization using aluminum

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Abstract

The metallization of diamond film has been studied by performing ab initio calculations of systems involving aluminum atom using efficient basis sets. Reasonable behavior of the Al atomic interaction with diamond has been revealed. It is shown that the Al diffusions into the diamond bulk are difficult, due to large barriers to overcome. For the high energy Al atom entering into diamond, the Al substitution for C atom is thermodynamically more favorable than the Al diffusion in the diamond.

Keywords: Aluminum; Diamond; Diffusion

1. Introduction

Owing to the success in the last decade in achieving heteroepitaxial diamond films [1–3], the desirable applications of diamond in advanced electronic devices appear to be realistic. The metallization is an important step in device processing, and the formation of low-resistance Ohmic contact for diamond with metals such as Al of electrode must be well studied. There have been a few reports on metallization of single crystal diamond film while polycrystalline CVD diamond have been frequently used as substrates in experiments [4–9]. It has been observed that the formation of good Ohmic or rectifying contacts is not always easily accomplished on diamond films grown by CVD [4]. The performance of Ohmic contacts on diamond depends on the choice of metals, doping concentration, surface pretreatment and so on. A deeper understanding of the various related problems such as metal diffusion into diamond and metal substitution for carbon atom in diamond should be important to realize such a key technology.

The metal–diamond interaction could be simulated using a cluster-model approach. However, this may lead to the computation of large systems in order to include relatively realistic environment of diamond. To perform the first-principle calculation for a reliable simulation, huge CPU time is required on using a medium level computation resource, indicating that a practical approach has to be searched. It would be desirable that an efficient scheme be developed for selecting basis sets with which the reliability of the result is maintained, while the computational resource used is minimal. Recently, the principle for choosing such a basis set for a non-metal system has been studied by the authors [10,11] and Truhlar and coworkers [12,13]. However, there is no previous work on the required efficient basis set for AlC materials systems.

In this work, various schemes for selecting basis sets have been examined in calculations for Al-containing systems using density functional theory (DFT). The $AlCH_x$ and $AlC(CH_3)_x$ ($x=1-3$) clusters simulating the Al–C bonding on diamond surfaces were selected for studying the basis set effect for AlC systems. The determined efficient basis sets were then used to calculate the interactions between Al and diamond film.

2. Theoretical approach and computation

Following previous work in treating a hetero-atomic system with an efficient basis set [10–13], we consider the difference in the role of the various basis functions adopted in the basis set. To examine the selection

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Table 1
Deviations of binding energies (in kcal/mol) with various basis sets from the values with 6-31G* basis set in B3LYP calculation[a]

	AlCH	$AlCH_2$	$AlCH_3$
6-31+G*	108.32	79.52	63.46
6-31G*	0.83	0.64	0.51
6-31G	−4.43	−2.45	−1.32
6-31G#{C}	−3.78	−2.57	−1.81
6-31G#{Al}	−0.40	0.78	0.97
	$AlC(CH_3)$	$AlC(CH_3)_2$	$AlC(CH_3)_3$
6-31+G*	110.81	71.29	46.55
6-31G*	1.15	1.01	0.32
6-31G	−3.72	−2.07	−2.07
6-31G#{C}	−3.14	−2.28	−2.44
6-31G#{Al}	1.37	0.97	−0.22
6-31G#{Al,C}	1.82	1.16	−0.23

[a] The basis set 6-31G#{Al} indicates that only the Al atom is described using 6-31G* while using 6-31G for other atoms. 6-31G#{Al,C} indicates that only the Al and C atoms directly bound to Al are described using the 6-31G* basis set while using the 6-31G basis set for all other atoms.

scheme of basis set for Al, we considered the following basis sets, 6-31+G*, 6-31G*, 6-31G, as well as the designed composite basis sets based on 6-31G. The 6-31+G* basis set specifies that each core orbital is described by one basis function composed of six primitive Gaussian functions, and each valence orbital described by two split valence basis functions having three and one primitives, respectively; the +, * represent an additional diffuse function and an additional *d* polarization function, respectively.

These composite basis sets were constructed by adding the polarization function to (1) Al; (2) atoms directly linked to Al; and (3) Al and the atoms directly bound with Al. Optimizations were performed with various basis sets using B3LYP approach [14,15] of density functional theory, and the corresponding binding energies were obtained in order to find out the efficient basis set for AlC systems. All calculations were carried out with the Gaussian 98 package [16].

3. Results and discussion

3.1. The efficient basis sets for AlC systems

Table 1 lists the calculated binding energies for Al-containing compounds considered in this work. The binding energies are the differences of the total energies with zero-point corrections, between Al–CH and Al+CH, $AlCH_2$ and $Al+CH_2$, $AlCH_3$ and $Al+CH_3$, $Al-CCH_3$ and $Al+CCH_3$, $AlC(CH_3)_2$ and $Al+C(CH_3)_2$, $AlC(CH_3)_3$ and $Al+C(CH_3)_3$. For $AlCH_x$/$AlC(CH_3)_x$ ($x=1-3$), the derived binding energies at the B3LYP/6-31+G* level are 108.32/110.81 kcal/mol, 79.52/71.29 kcal/mol and 63.46/46.55 kcal/mol, respectively. We find that the distinctions of the binding energies for the single, double and triple Al–C bonds are much smaller than those for the various C–C bonds. By comparing the results of 6-31+G* and 6-31G* (Table 1), it is obvious that the effect of diffusion function on the calculated binding energies is small and can be ignored. Further, when the polarization function of the Al atom is introduced (denoted as 6-31G#{Al} basis set), the calculated binding energies are greatly improved. The accuracy of the 6-31G#{Al} binding energies is at the same level as that of 6-31G*. Table 2 shows the deviations of optimized geometrical parameters for $AlCH_x$ and $AlC(CH_3)_x$ ($x=1-3$) with various basis sets from those calculated with 6-31+G* (Fig. 1). Obviously, the calculated Al–C bond lengths at 6-31G#{Al} compares well with those of the standard 6-31+G*.

The above analysis of basis set effects indicates that the addition of the polarization function to only the Al atom involved in the Al–C interaction can yield much accurate results of geometrical parameters and binding energies. The reduction of total number of basis functions and the improvement of the computational efficiency thus makes it possible to calculate large AlC materials molecules with excellent accuracy. The decrease of the basis-set size would reduce the limitation of the computer disk space and may greatly save CPU time. Table 3 lists the CPU times with different basis sets at SGI Origin200 (4×R10 000) server machine for frequency calculations of $AlC(CH_3)_3$, along with the number of basis functions. It shows that the designed composite basis sets 6-31G#{Al} saves as much as approximately 75% CPU time compared with 6-31+G*. The reduction in CPU time would be greatly enlarged when a larger AlC system such as that simulating Al substitution in diamond is considered.

Table 2
Deviations of optimized geometrical parameters with various basis sets from the values with 6-31G* basis set in B3LYP calculation [a]

	AlCH	$AlCH_2$	$AlCH_3$
	Al-C	Al–C	Al–C
6-31+G*	1.964	1.990	2.012
6-31G*	−0.010	−0.006	−0.005
6-31G	0.024	0.015	0.015
6-31G#{C}	0.022	0.019	0.021
6-31G#{Al}	−0.012	−0.013	−0.011
	$AlC(CH_3)$	$AlC(CH_3)_2$	$AlC(CH_3)_3$
	Al–C	Al–C	Al–C
6-31+G*	1.950	1.993	2.048
6-31G*	−0.007	−0.006	−0.004
6-31G	0.027	0.021	0.021
6-31G#{C}	0.025	0.023	0.023
6-31G#{Al}	−0.009	0.009	−0.009
6-31G#{Al,C}	−0.008	0.005	0.003

[a] Bond lengths in angstroms.

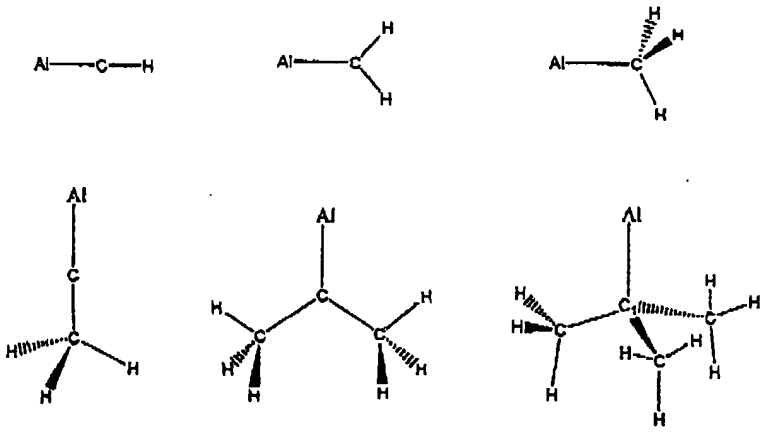

Fig. 1. Optimized structures of AlCH, $AlCH_2$, $AlCH_3$, $AlCCH_3$, $AlC(CH_3)_2$ and $AlC(CH_3)_3$.

3.2. Al interactions with diamond surfaces and Al substitution in diamond

To reveal the mechanism of inter-diffusion in the metallization of diamond, potential energy surface (PES) scanning and substitution of a Al atom for a C atom in diamond phase were performed with DFT theory using the efficient 6-31G#{Al} basis set. The potential energy surface scannings were performed without relaxations of diamond-like clusters by considering the surrounding steric hindrance in the diamond bulk. This would overestimate the diffusion barriers of Al atom at some level due to the fixed substrate clusters, but would not change the conclusions of the Al diffusion behaviors on (001) and (111) surfaces and in the diamond bulk, because of the large differences in the corresponding diffusion barriers.

The substrate cluster models, C_9H_{16} and $C_{10}H_{16}$, for Al diffusions into diamond (001) and (111) surfaces are shown in Fig. 2. In this work, we didn't take into account the surface relaxation effects such as dimerization; the ideal (001) and (111) surfaces are used for our study of Al diffusion. The behaviors of the deposited Al atom on diamond (001) surface are shown in Fig. 3a and b. It can be seen that the Al atom requires approximately 20.8 eV to overcome the energy barrier so as to enter the diamond bulk through (001) surface. There is a minimum with 2.5 eV stabilization energy

Table 3
CPU time and the number of basis functions for $AlC(CH_3)_3$ with various basis sets in B3LYP calculation

Basis set	6-31+G*	6-31G*	6-31G#{Al}
Number of basis functions	112	92	72
CPU time (min) for frequency calculation	34	23	12

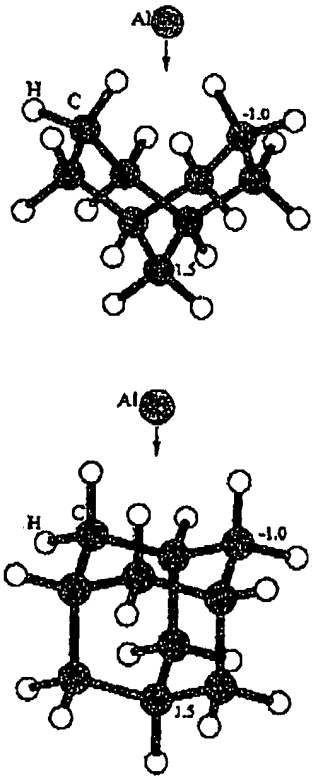

Fig. 2. Substrate cluster models for Al diffusions into diamond (001) and (111) surfaces (numbers indicate Z coordinates).

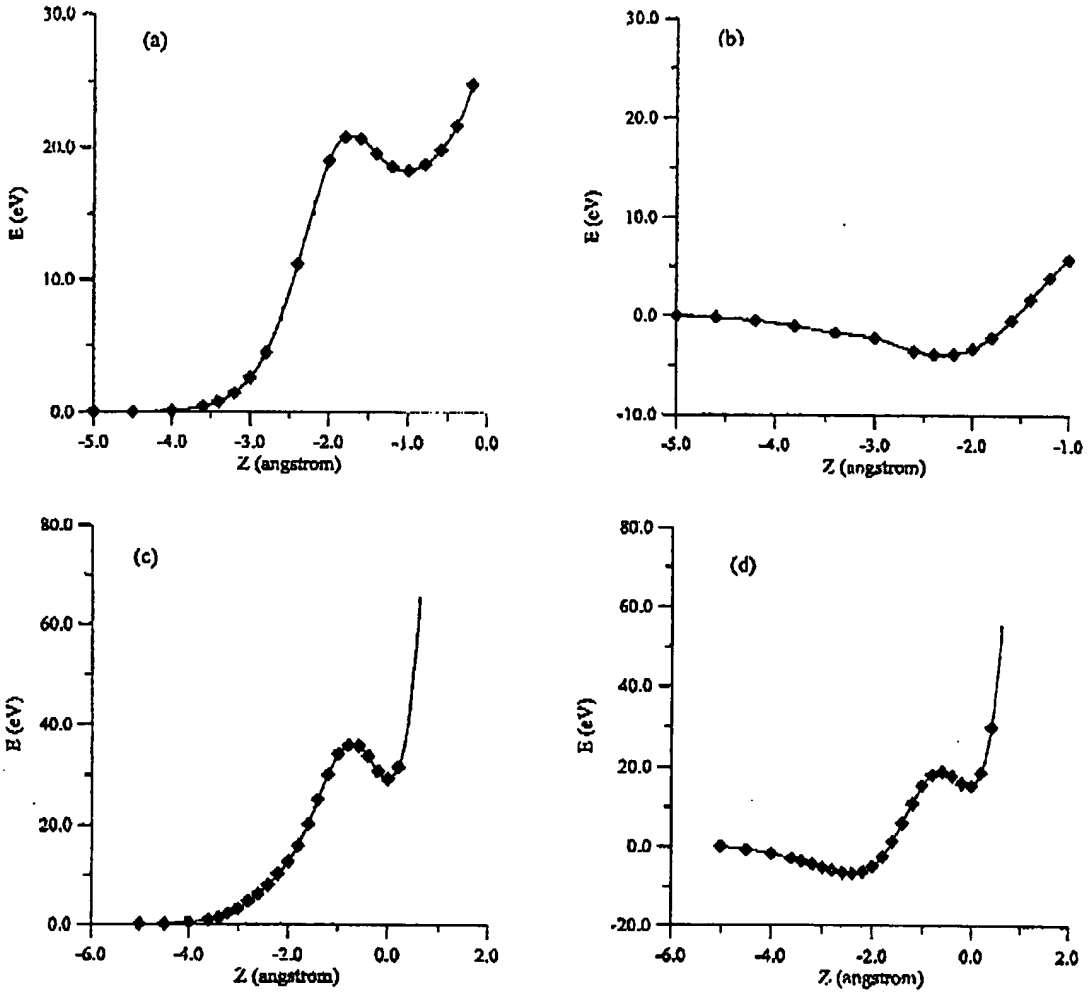

Fig. 3. PES scanning curves for Al diffusions on the saturated (a) and the unsaturated (b) diamond (001) surfaces and the saturated (c) and the unsaturated (d) diamond (111) surfaces at the B3LYP/6-31G*(Al) level.

after that barrier. This diffusion process is endothermic by 18.3 eV. Moreover, the PES calculation is also performed using an unsaturated diamond (001) surface with the two of the top two hydrogen atoms taken away. In such a case, there is a complex at approximately $Z = -2.4$ Å, stabilized by approximately 3.9 eV, which corresponds to a bridge site, while the barrier feature disappears and the Al atom can easily go into space between the first and the second surface layers.

For the Al atom depositing onto the diamond (111) surface along the symmetrical line of the $C_{10}H_{16}$ model in Fig. 2, the corresponding potential energy curve is illustrated in Fig. 3c, showing quite a large energy barrier of approximately 36.1 eV for a Al atom crossing the surface layer. When the Al atom approaches further to the bulk, there appears a minimum stabilized by 6.8 eV. This diffusion process is shown to be endothermic by as much as 29.3 eV. Fig. 3d shows the energetics of a similar diffusion process of the Al atom, but on an unsaturated surface with the top three hydrogen atoms moving away. Compared to the hydrogen-saturated surface, the energy barrier of 19.0 eV is greatly cut down, but still too high for the Al diffusion to the bulk diamond. The stabilization energy for the Al atom after entering the bulk diamond is 3.5 eV. Although the relaxation of the diamond surface structure in experimental Al deposition can lower the energy barrier of the Al diffusion to some extent, it can be estimated that the

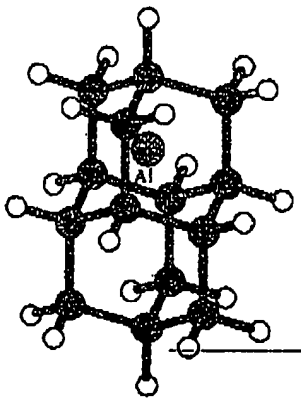

Fig. 4. Substrate model for Al diffusion in the bulk of diamond.

Al diffusion through diamond (111) surface is too difficult.

After crossing the diamond surface (probably through diamond (001) surface), the behavior of Al in the diamond bulk is further studied. For the diffusion of Al in the diamond bulk, the $C_{14}H_{20}$ cluster model (Fig. 4) is used as a substrate. The calculated results show that the Al diffusion from one cell to another requires approximately 8.1 eV (Fig. 5a), which is much smaller than the energy barriers for Al passing through the saturated diamond (001) (20.8 eV) and diamond (111) (36.1 eV) surfaces. To compare with the Al diffusion in the diamond bulk, the C behavior was also studied (Fig. 5b). It is found that the interstitial minimum for a C atom is located at the interface of two cells (Z=0), different from the case of the Al atom of which the minimum site slightly deviates from the center of each cell. The C diffusion through the diamond bulk is seen to be much easier than Al, which requires approximately 3.0 eV to move from the interfacial minimum to the center of a cell and then diffuse into another cell.

However, the Al atom could probably take a substitution site. The cluster model $AlC_{28}H_{36}$ (Fig. 6) was chosen for the study of substitution. The structure was optimized at the B3LYP/6-31G#{Al} level. For Al and C located in the diamond bulk, their energy difference is decreased compared to that between the free Al and C atoms, due to the larger steric interaction for Al in the bulk diamond. Thus, for the substitution $Al+C_{29}H_{36}\rightarrow C+AlC_{28}H_{36}$, the energy of Al or C atom should correspond to that at the interstitial, the minima as shown in Fig. 5. In this case, it is found that the substitution of an Al atom for a C atom is exothermic by approximately 3.0 eV. Thus, from the thermodynamic viewpoint, the Al atom in the interstitial site shows a tendency of substitution for a C atom.

In view of the various energetics of Al depositing onto the diamond surfaces, it is found that the Al diffusion through diamond (001) surface, especially the unsaturated one, is much easier than through diamond (111) surface. For the further Al diffusion in the bulk of diamond, the energy barrier (8.1 kcal/mol) is still very large, indicating that it has much less chances to occur in a pure thermal process like annealing. Thus, a thermally evaporated Al deposition may cause little Al diffusion into the single crystal of diamond, but may favor bond formation with the surface C atoms, especially those on diamond (001) surface. For a CVD

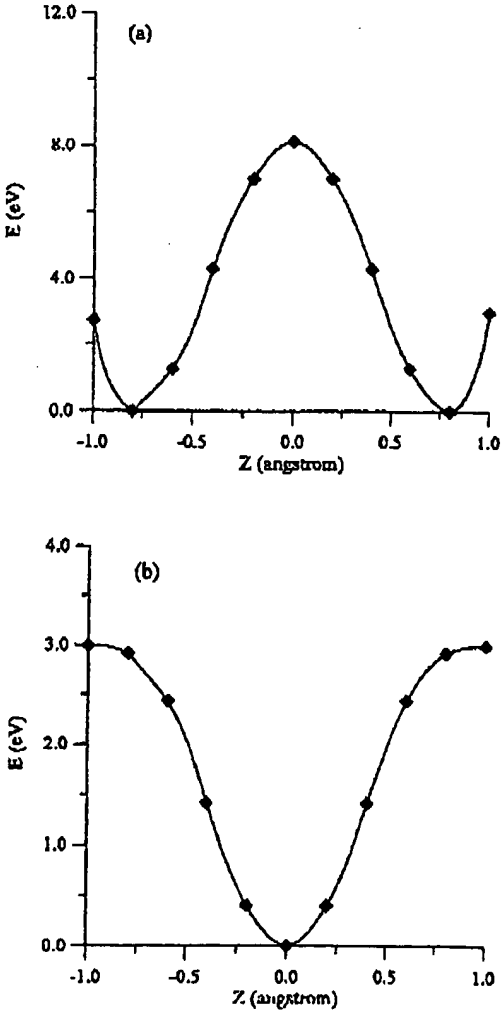

Fig. 5. PES scanning curves for Al (a) and C (b) diffusions in the bulk of diamond at the B3LYP/6-31G#{Al} level. The center of the cluster model shown in Fig. 4 corresponds to Z=0.

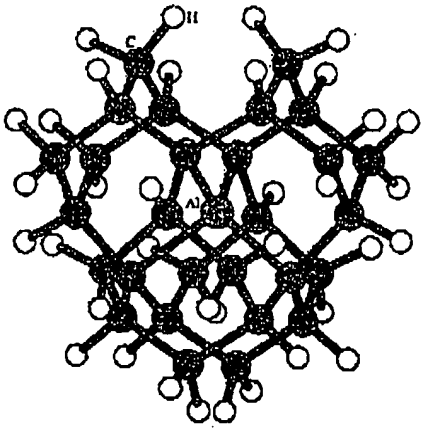

Fig. 6. Cluster model for substitution of an Al atom for a C atom in diamond.

diamond film, which is normally polycrystalline, the Al atom may go into the boundary. However, if the Al atoms with higher kinetic energy were used, they would likely pass through the diamond (001) surface, diffuse further into the bulk of diamond and form AlC phases. Comparing the energetics of Al diffusion in diamond bulk and taking a substitution site, the Al atom of high energy may favor substitution from the thermodynamic viewpoint, suggesting the facilitation of the mixed AlC system formation.

4. Conclusions

The basis set 6-31G#{Al}, which applies polarization function only to the Al atom is shown to be advantageous and efficient for predicting reliable geometries and binding energies for large AlC systems. The application of this efficient basis set in simulation of metallization of diamond film has revealed reasonable behavior of Al atomic interactions with diamond. The calculations show that the Al diffusion into the diamond bulk is very difficult, suggesting that the high concentration of Al in CVD diamond after metallization would occupy the grain boundaries rather than the bulk of diamond grain. High deposition energy using sputtering or ion implantation may result in Al penetrating the diamond (001) surface to the bulk and then a favorable Al substitution for C atom.

Acknowledgments

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